OCT 25 192

Founded 1874—Fifty-Two Years of Service

Electrical World

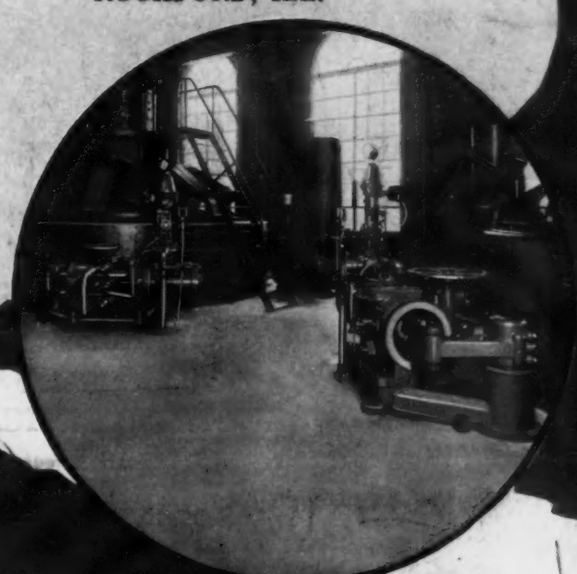
McGraw-Hill Publishing Company, Inc. Price Twenty-five Cents Per Copy

October 23, 1926

THE adaptability of Woodward Governors to every modern Hydro-Electric requirement has given them world-wide acceptance. More than 50 years of specialized effort in Governor development is proving its great significance wherever a Woodward Governor is installed. To specify a Woodward Governor when ordering a water wheel is to *fully provide against* involved installation adjustments, after purchase costs, operating troubles and expensive maintenance. Write for our new and informative catalog.

Interior view of Northern New York Utilities Co., Soft Maple Plant. Each unit develops 10,500 h. p. and is the highest powered automatic unit in operation to date.

WOODWARD GOVERNOR CO.
ROCKFORD, ILL.

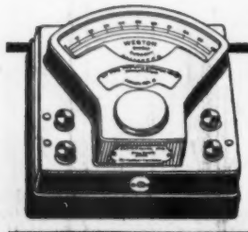


WOODWARD
WATER WHEEL
GOVERNORS

Are You Getting All You Can From WESTON 155?

ARE you using it for quick, precise measurements, for locating power leaks, for equalizing circuit loads, for correcting low voltage conditions, for general maintenance of electrical equipment. ¶This Weston Model has these uses—a truly versatile model designed for the hardest use, yet accurate and dependable over extremely long periods. ¶ This model is provided as A.C. Voltmeters, Ammeters and Milliammeters. They are light in weight and easily portable. ¶ There may easily be uses of Weston equipment already in your possession to which you have not applied it. Our staff is eager to be of assistance in this way and will be glad to receive queries with regard to it.

WESTON ELECTRICAL INSTRUMENT CORPORATION
13 Weston Avenue, NEWARK, N. J.



STANDARD THE WORLD OVER

WESTON

Pioneers since 1888

Vol. 88, *No.* 17 New York, October 23, 1926 *Pages* 841-890

L. W. W. MORROW
Managing Editor
EARL E. WHITEHORNE
Commercial Editor
ALLEN M. PERRY
Associate Editor
G. F. WITTIG
Statistical Editor
H. M. CAMERON
Financial Editor
F. C. WELLS
News Editor
EUSTACE C. SOARES
Manufacturing and Markets Editor
L. H. CHURCH
Assistant Editor

Electrical World

The Consolidation of Electrical World, Electrical Engineer and American Electrician

W. H. ONKEN, JR., *Editor*

FRANK R. INNES
Western Editor
7 South Dearborn St., Chicago
H. S. KNOWLTON
New England Editor
88 Tremont St., Boston
WALTER C. HESTON
Pacific Coast Editor
583 Mission St., San Francisco
T. P. KINDIG
Assistant Editor
401 Guardian Bldg., Cleveland
PAUL WOOTON
Washington Correspondent
Colorado Bldg., Washington
R. L. SHEPHERD
Southern Editor
Alabama Power Co. Bldg.,
Birmingham

CONTENTS

Editorials 841

Frontispiece—New Bridge Cranes of the Inland Steel Company 844

Kenotron Study of Cable Insulation 845
By D. E. REPLOGLE AND T. M. BURKHOLDER.
This article shows the relation between temperature and leakage current and the effect of ionization and voltage changes. The author concludes that the voltage at which ionization occurs is a possible index of impregnation.

Rainbow-Estes Plant at Ausable Chasm 848

Electric Heating Load Grows Rapidly 849
By ROBERT M. KEENEY.
A study of the industrial heating load of the Connecticut Light & Power Company, which is growing twice as rapidly as the motor load.

Radio Interference 851
By ROY B. ASHBROOK AND RALPH W. WIGHT.
Man-made interference is largely controllable, but the extent and method of suppression must depend on the economics of the situation, say the authors.

Some Problems Confronting the Young Engineer 854
By F. C. SMITH.
An interesting article giving some of the experiences and impressions of an engineer who has been out of college four years.

The Automatic Secondary Network System in Memphis 855
A description of the way in which the original underground distribution was changed over with a minimum waste of the cable and equipment that was already installed.

Electricity Replaces Oil in British Lightships 857

Safety Switches and Meter Cabinets Deter Tampering 858
By A. P. GOOD.

Flexible Equipment-Handling Facilities 858

Letters from Our Readers 859

Central Station and Industrial Practice 860
Electrical Equipment for Sewage Disposal Plant 860
Baking Insulated Coils in the Electric Oven 860
Laying 200 to 400 Ft. of Fiber Duct per Hour 861
Effect of Cable Short Circuit on Conduit 863
Synchronous Motor Substituted in Large Paper Mill 863
Cost of 10,000-Kva. Condenser Installation 863

Commercial Activities and Public Relations 864
Rural Service Exhibit Without Utility Expense 864
Build Borrowing Power to Avoid Speculator's Prices 864
Rates for Street Lights Reduced in Alabama 865
Campaign in Memphis Nets 43,000 Lamps 865
Uniform Local Offices for Large Utility 865
District Window Displays Made Uniform 866

Digest of Electrical Literature 867

News of the Industry 869

Men of the Industry 877

Court Decisions, Commission Rulings 879

Financial and Corporate 880

Manufacturing and Markets 884

Activities of the Trade 886

New Equipment Available 887

Construction News 888

Electrical Patents 890

Electric Refrigeration Surveyed

IN THE issue of the ELECTRICAL WORLD for October 30 will appear a national survey of the electric refrigeration situation. Editors have visited more than two hundred localities and have obtained first-hand information from all interested in electric refrigeration. Utility executives, sales managers and service and sales staffs have been interviewed. Local dealers, jobbers and distributors have discussed their problems and experiences with our editors.

The mass of data comprises a tabulation of more than 50,000 items, and the editorial discussion of the situation covers sixteen pages of the ELECTRICAL WORLD. The editors devote this space and have spent money and time to get material because they sensed the need for an impartial and complete survey of conditions.

The coming issue will enable the industry to develop electric refrigeration intelligently. No one in the electrical industry can afford to miss seeing this sample of ELECTRICAL WORLD editorial service.

McGRAW-HILL PUBLISHING COMPANY, INC.
Tenth Ave. at 36th St., NEW YORK, N. Y.

JAMES H. McGRAW, President
JAMES H. McGRAW, JR., V.-Pres. and Treas.
MALCOLM MUIR, Vice-President
EDWARD J. MEHREN, Vice-President
MASON BRITTON, Vice-President
EDGAR KOBAK, Vice-President
C. H. THOMPSON, Secretary

WASHINGTON, Colorado Building
CHICAGO, 7 South Dearborn St.
PHILADELPHIA, 1600 Arch St.
CLEVELAND, Guardian Building
ST. LOUIS, Star Building
SAN FRANCISCO, 883 Mission Street
LONDON, 6 Bouverie Street, London, E. C. 4

Cable Address "Machinist, N. Y."
The annual subscription rate is $5 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala, Haiti and Paraguay. Extra foreign postage, $4 (total $9 or 38 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 25 cents.
Change of address — When change of address is ordered the *new* and the *old* address must be given. Notice must be received at least ten days before the change takes place.

Copyright 1926
By McGraw-Hill Publishing Company, Inc.

Published weekly
Entered as second-class matter Jan. 20, 1907, at the Post Office at New York, N. Y., under the Act of March 3, 1879.
Printed in U. S. A.
Circulation of this issue, 19,525

Publishers of
Engineering News-Record — American Machinist
Power — Chemical and Metallurgical Engineering
Coal Age — Engineering and Mining Journal
Ingeniería Internacional — Successful Methods
Bus Transportation — Electric Railway Journal
Electrical World — Electrical Merchandising
Industrial Engineer — Radio Retailing
Journal of Electricity
(Published in San Francisco)
American Machinist—European Edition
Published in London

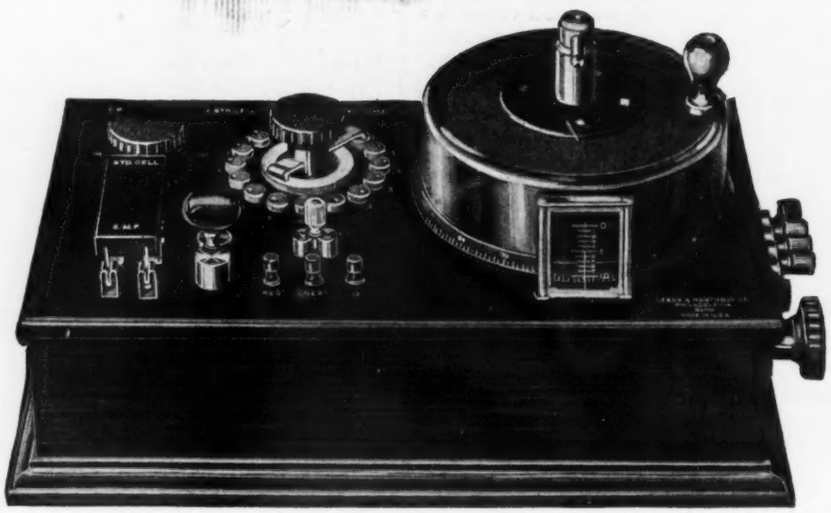
Member Audit Bureau of Circulations
Member Associated Business Papers, Inc.

Advertising Index—Alphabetical, 108; Classified, 102, 104, 106; Directory of Engineers, 50, 51; Searchlight Section, 52-58

The Type K Potentiometer

In Use in the Large Majority of Meter Standardizing Laboratories in America

For Precise Instrument Calibration



An *Important* Feature

THE design of the Type K Potentiometer is such that its accuracy can be determined to the nearest .01 per cent with ordinary instruments available in any standardizing laboratory. Accordingly the user need never be in doubt about the accuracy of his Type K Potentiometer.

7551 TYPE K POTENTIOMETER.....$275.00

Write for Bulletin W-755

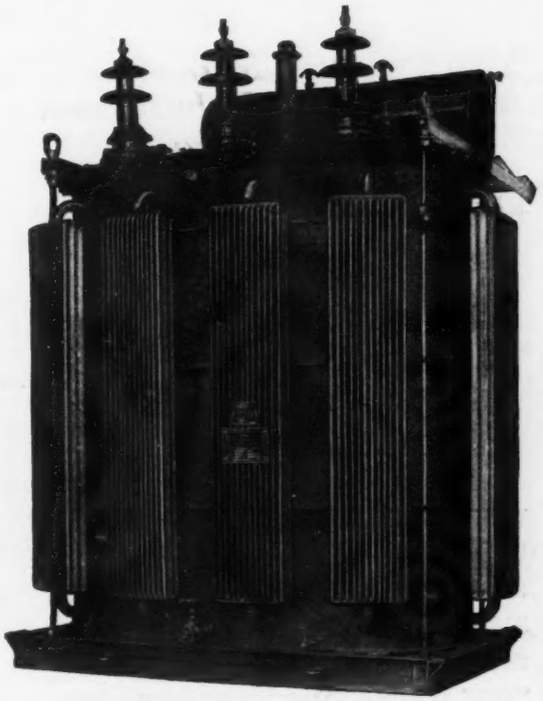
LEEDS & NORTHRUP COMPANY
4901 STENTON AVENUE, PHILADELPHIA

LEEDS & NORTHRUP

Galvanometers
Potentiometers
Bridges and Resistances
Condensers and Inductances
Testing Sets
Recording and Controlling Pyrometers
Hump and Homo Electric Heat Treating Furnaces
Instruments for Measuring and Controlling Conductivity of Electrolytes and Hydrogen Ion Concentrations

G

Noiseless Operation of Pittsburgh Polyphase Transformers



Pittsburgh Polyphase Transformer equipped with three Pittsburgh Tap Changers, cooled with Pittsburgh Film Radiators, protected by Pittsburgh Expansion Tank.

One of the advantages of the Pittsburgh Polyphase Transformers is its noiseless operation. This is of particular interest to the Company whose substations are in the residential districts, as it fits in with the present-day policy of erecting high class, beautiful substation buildings. This noiseless operation of Pittsburgh Polyphase Transformers led to their adoption by one of the large Public Utilities in the United States for installation in all substations in residential sections.

A test made in our factory recently of three large Polyphase Power Transformers on test, after all machinery was closed down, showed practically no sound from the transformers even as close as twenty-five feet.

When you have the specifications ready for your next order for transformers, let us submit proposal on Pittsburgh Transformers.

Pittsburgh Transformer Company

Largest Manufacturers of Transformers exclusively in the United States

Pittsburgh, Pennsylvania

BETWEEN FRIENDS

Your requirements of your friends are probably many, but foremost among them is reliability—reliability at all times and under all circumstances. Kuhlman Transformers are like true friends—you can always depend upon them to serve you unfailingly and with high all-day efficiency.

The Kuhlman Organization is a friendly one—ever ready and willing to be of service—to help you out of a difficulty—to make an extraordinary delivery to meet requirements you could not anticipate—to aid in solving your transformer problems.

Write the office nearest you.

KUHLMAN ELECTRIC CO.
Bay City, Michigan

Atlanta.....411 Glenn Bldg.
Boston .....69-71 High St.
Buffalo .....280 Carolina St.
Chicago .....844 Rush St.
Cincinnati..1308 Union Trust Bldg.
Cleveland.....500 East 102d St.
Dallas.....Unit 2, Santa Fe Bldg.
Denver.....1843 Wazee St.
Detroit...3-260 Gen. Motors Bldg.
Indianapolis
202 Indiana Term'l Warehouse
Los Angeles
316 American Bank Bldg.
Milwaukee.....1031 Clybourn St.
Minneapolis....1004 Marquette Ave.
New York.....300 Madison Ave.
Omaha.....727 W. O. W. Bldg.
Philadelphia.....1700 Walnut St.
Pittsburgh.....839 Oliver Bldg.
Saint Paul.....1479 Blair St.
Salt Lake City
134 W. 2nd South St.
San Francisco.....Call Bldg.
Seattle .....314 Seneca St.
Toledo .....424 Spitzer Bldg.
Tulsa.....318 So. Boulder St.
York, Pa.....335 W. Market St.

KUHLMAN TRANSFORMERS

POWER-DISTRIBUTION-STREET LIGHTING

Electrical World

Published by McGraw-Hill Publishing Company, Inc.
W. H. ONKEN, JR.
Editor

VOLUME 88 — *New York, Saturday, October 23, 1926* — NUMBER 17

Industry Should Welcome Criticism

THE promised article by Prof. William Z. Ripley on public utilities will soon make its appearance. What it will contain remains to be seen. Some electric public utilities and holding companies are certain to come in for attention and censure, but, however close or wide of the mark the eminent economist comes, it is expedient that the electric light and power industry maintain its poise. It would be a great mistake to fly off at a tangent, and a greater mistake still to attempt to muffle Professor Ripley, or for that matter any other honest critic who has no motive other than the public weal. The scriptural injunction is to avoid the appearance of evil as well as to avoid evil itself.

The electric light and power industry on the whole has been so busy attending to its business that it has had little time or inclination to take stock of itself. If it did, it would probably find something that is at fault. To have some one like Professor Ripley do the stock-taking and the criticising is helpful, because he is the type of man who will correct his own mistakes. After all, he seeks only the public good, and that is what the electric light and power industry also seeks. Unfortunately, however, the good are apt to suffer with the bad in any general stricture of business ethics by Professor Ripley; but it would be better to endure such chastisement rather than make matters worse by ill-considered and ill-advised rejoinders. Professor Ripley's admonition to "stop, look and listen" is safe and sane at this particular time. To ignore it is to solicit trouble and court public ill will.

Getting Some Facts Behind Selling

MANY commercial managers often find themselves facing a problem in which they need data to check their departments' achievements with those of other companies, to ascertain sales possibilities of this or that application in their territory, to indicate the cost of securing and the yearly revenue from different classes of business, and so on. Power salesmen in particular long for specific experience data on this or that industrial application, some figures on steam heating or process-steam requirements, interruptions of isolated-plant service, rate at which investment can be turned over in different industries compared with that in a power plant and similar information to help clinch some new or additional business contract. Certainly, without specific data they would have to proceed blindly, usually with some delay and probably without achieving results at which they aim.

Scarcity of selling data is partly the individual company's fault and partly an industry fault. It is not unusual to find a commercial department so busy trying to get business that it possesses no time to collect data with which to effect sales. As a consequence attempts are made to sell purchased power service or new applications of power on such generalities that it is surprising any but self-convinced customers are ever obtained.

Of course, not all commercial departments are subject to this criticism. The Northern States Power Company, for example, maintains a commercial statistical department which collects or develops useful data for sales purposes, and no doubt there are many other statistical bureaus which undertake to provide the commercial department's needs.

The idea of making working data available to the commercial department seems to be an excellent one that every company can well afford to adopt. Whether the data are collected by a special commercial statistical department, a general statistical department or individuals in either department does not matter. When salesmen have readily available facts on which to base sales arguments they are in a position to obtain more and better business than when they are compelled to talk generalities.

System Plans Hold Attention of Engineers

MANY people think engineers are entirely too serious and too logical to be pleasant companions on the golf course or at dance parties. Perhaps it is a good thing for the light and power industry that work instead of play is the slogan of engineers at their meetings. They quietly but enthusiastically study, digest and plan industry developments of all kinds as each new development or policy affects their work. They are the first to sense a change in industry conditions and to adapt themselves and their work to the change.

Last week in Chicago the Engineering National Section of the N.E.L.A. worked out its plan for this year. More than three hundred engineers met in a body and in the several committees to discuss conditions and to formulate programs. They took their work seriously and did the job laid out for accomplishment by their leaders. This task is the building of plans whereby the light and power industry will advance in service standards and economic accomplishments. They seek to focus details so as to give them a system perspective and then to organize their work in the industry to obtain their objectives most effectively. Their leaders announce that the time has ceased for this industry to "just grow" in the time-honored method of Topsy. Superpower, networks, interconnections, power factor, system stability and other terms have a tangible and definite meaning to engineers. They realize the necessity for the careful scrutiny of catchwords and ideal plans and yet have the imagination to direct their efforts along constructive lines when new thoughts have been mastered and checked against fundamental engineering and economic knowledge.

Congratulations are due the light and power engineers for their logical development of plans for industry

betterment. It almost seems advisable for them to have at least one national engineering meeting a year to discuss their major plans and problems. Much of value could be derived from an annual meeting of a large number of utility engineers with a procedure similar to that customary at Engineering Section meetings. Conflicting meetings could be eliminated and major topics only would be selected for discussion. The several committees could meet and do their work at other convenient places and times during the year.

Telling the Story of Rural Electrification

A GOOD interpretation of rural electrification and what it means in terms readily understandable by the layman is to be found in the October issue of *Powergrams*, the quarterly publication of the Alabama Power Company. In the issue about 30 of the 48 pages have been devoted to rural electrification. The work in Alabama has included a great deal of research and experimentation undertaken with the view of adding new uses in order that electrified farming may be developed to its fullest degree. Through the co-operation of the power company, the experiment station of the Alabama Polytechnic Institute and the Alabama Farm Bureau Federation, rural electrification in Alabama is rapidly emerging from the experimental stage, as is shown in the figures printed as of July 1 of this year. At that time there were 61 rural lines in Alabama totaling 270.8 miles with 2,860 customers, 1,589,000 kw. having been the energy consumption for the twelve months then ended. There was, besides, 108.7 miles of lines under construction or projected, and these lines will serve 1,142 customers.

Value of the Industrial Electric Heating Load

SPECIFIC instances of the economic attractiveness of the industrial electric heating load are well worth executive study, and the article by Robert M. Keeney published elsewhere in this issue deserves thoughtful reading by electric light and power men serving metal-working plants in particular. Naugatuck valleys are few and far between, even in this country of great regional industries, but there is a lesson for small as well as large central stations in use of the connected load and of the demand in this class of business. In both melting and heat treating there is a good diversity factor, the ratio of the demand to the connected load being 70.6 per cent in the former and 64.1 per cent in the latter. The average load was 48.8 per cent of the connected load in melting and 26.3 per cent in heat treatment. In the ovens and miscellaneous applications the demand represented in 1925 94.8 per cent of the connected load. The use fell off a good deal in comparison with the more nearly continuous process of melting. Heat treating also has been an admirable load builder for the Connecticut Light & Power Company.

The total energy consumption recorded in the tables and plotted against years for different classes of business shows that if territorial development proceeds along present lines, the industrial electric heating load of this company may exceed its very large power load inside of fifteen years. Since the close of the war the electric power business has gained a healthy 174 per cent—no mean achievement in itself for an energetic sales department—but the heating load has gained 440 per cent. Nearly a million kilowatt-hours a week are now consumed in industrial electric heating in this territory. These totals win congratulation for the company, but the chief significance of Mr. Keeney's article is its indication that proportionally satisfactory results can be secured by companies of all sorts and conditions which are willing to go after this class of loads when potential in their territory, and, last but not least, with the full support of their managements in the training of sales engineers to meet the analytical problems incidental to this important and generally highly profitable service to industry.

Water Power an Issue in New York

FOR several years the development of water power has been an issue in New York politics. Each candidate for governor airs his views for political purposes before election, and yet no water-power development occurs after election. The campaign this fall repeats history. Ogden L. Mills, the Republican candidate, favors water-power development by private capital and management under limited leases. Alfred E. Smith, present Governor and candidate for re-election on the Democratic ticket, favors a state Water Power Authority and perpetual public ownership and control of water-power sources by the people of the state. These are familiar political statements and have the vagueness and safety of the usual vote-getting pronouncements.

Water-power development in New York is an international subject, for the Niagara and the St. Lawrence Rivers offer the only large hydro-electric sources. It should not be a state political question to be used in vote getting, and a political approach to its solution will continue to produce plenty of talk and no development. It is high time for state leaders to realize that the waters of the Niagara and the St. Lawrence should be put to work according to a well-considered plan. Such a plan, free from political bias, should be made and put into operation.

Industrial Lighting Progress Shown by Greater Safety

WORKERS need proper and adequate lighting not only in order to be more efficient but also to be safer from accidents. It has been adequately proved that good lighting in workplaces more than pays for itself in increased production. Of course, such tangible factors as increased production and decreased spoilage are more readily appreciated than the less tangible ones like greater safety and better morale. However, tangibility is merely a matter of the extent of accurate data available. Through constant analysis of the causes of accidents the insurance companies have steadily increased the tangibility of the relation between good lighting and safety. R. E. Simpson has particularly contributed in this direction. According to him a decade ago improper and inadequate lighting was decidedly a contributing factor in one out of every four

industrial accidents. Considering how intimately lighting and vision are related, it is surprising that bad lighting conditions do not figure prominently in an even larger proportion.

Although much remains to be done toward improving lighting and visual conditions in the nation's industries, it is interesting to note the influence of improvements during the past decade. According to Mr. Simpson improper illumination and defective vision at the present time are major factors in one out of every eight accidents. Regardless of the relation of good lighting to increased production and decreased spilage, the job of industrial lighting cannot be considered well done until no accidents to workers are attributable to faulty lighting. There is still much work to do, and this work will be paid for by the elimination of the loss caused by accidents. Perfect safety from the standpoint of illumination would pay the entire industrial lighting bill in this or in any other country.

Standard Apparatus Can Be Adapted to Avoid Multiplicity

FREQUENTLY when a new device is being developed by a manufacturer and special apparatus is desired the tendency is for the manufacturer to undertake the further development of auxiliary equipment, even though such apparatus in a highly developed stage is already available on the market. Shop equipment, quantity production and other factors undoubtedly affect the decision as to whether to buy or to make the article, but only too often the manufacturer prepares to build his own apparatus, despite the availability of standard equipment, rather than use another company's product, thus evincing disregard of the economic factors involved. In the interests of simplification, to avoid increasing the multiplicity of similar products and to promote cost reduction, standard well-known apparatus should be adapted wherever it can be economically applied.

One Hundred Million Dollars for Advertising?

RETAIL clothiers are informed by one of their leaders that they must be prepared to spend 6 per cent of their receipts for advertising. If this figure were applied to the electric light and power industry, it would have an annual advertising bill of considerably more than one hundred millions of dollars—a staggering, a preposterous sum, yet only because of this industry's point of view. Universally the public, and frequently the light and power industry, still clings to the idea that a public utility is a monopoly. Those who so think forget that the only real competition in this country is competition for the public's dollar.

The retail clothier spending 6 per cent of his gross revenue in advertising is not advertising in competition with other clothiers; he is advertising in competition with the man who sells diamonds for a dollar a week, with the restaurant, the cigarette manufacturer, the automobile, correspondence school and savings bank. He realizes that he is but one of a thousand competitors who are scheming, striving, clamoring for every dollar in circulation and for some that are not. The clothier now spends 3 per cent in this fierce competition and is prepared to spend twice that. The electric utilities spend a small fraction of 1 per cent and are seeking through the alchemy of co-operation to spend less. Which is the wiser? Judged by results, the clothier. He, knowing he is in competition, competes. Having heard repeatedly that the utility business is non-competitive, many utility men figuratively sit down in the pasture and wait for the cow to back up to be milked.

Transient Records Conquered by the Ingenuity of Researchers

THE difficulties met in studying experimentally the wave fronts, amplitudes and oscillations of high-voltage transients are well known. Nothing illustrates these difficulties better than the character and the performance of certain methods and instruments which have been recently offered. Even in the laboratory with the cathode-ray oscillograph, as modified by Dufour, it is difficult enough to obtain rapid, accurate and constant observations of high-voltage transients. When it comes to observations in the field, in which it is desired to have a continuous record, the difficulty appears to be almost unsurmountable.

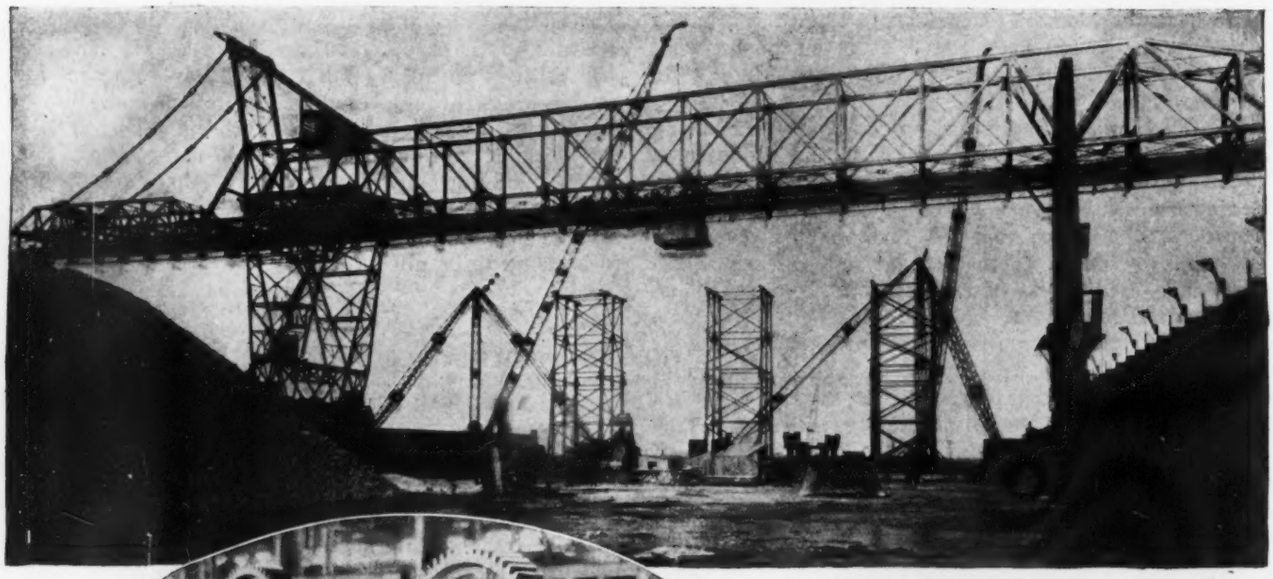
In spite of this situation research engineers have attacked the problem and have produced an instrument —the klydonograph—which certainly seems to respond in large measure to the differences in magnitude and character of high-voltage transients. The instrument depends on the so-called Lichtenberg figures produced on a photographic plate by the discharge taking place around a high-voltage electrode in approximate contact with the plate. Published results of the tests indicate a relationship between the diameter of the figure on the photographic plate and the maximum value of voltage, the polarity and other features of the transients. The accuracy of those relations, however, is far from perfect, and besides the records of the instrument require an experienced eye for their interpretation.

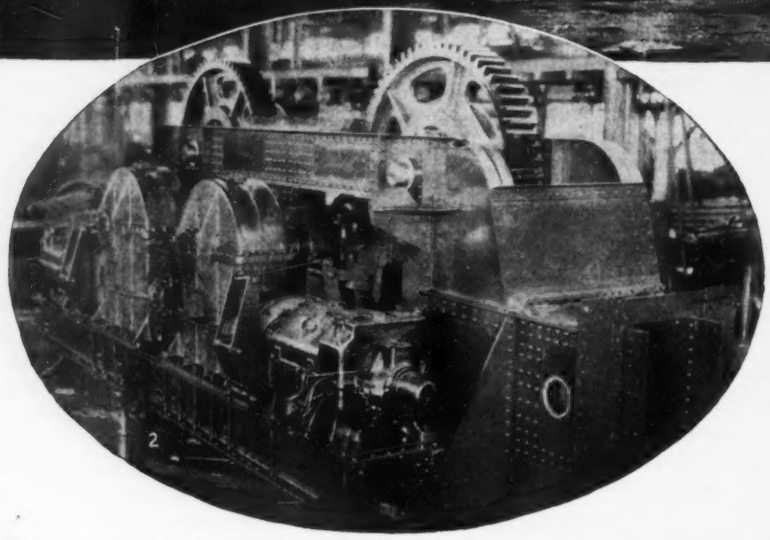
The question of accuracy is still further complicated by some work recently reported by K. B. McEachron in the October *Journal of the A.I.E.E.*

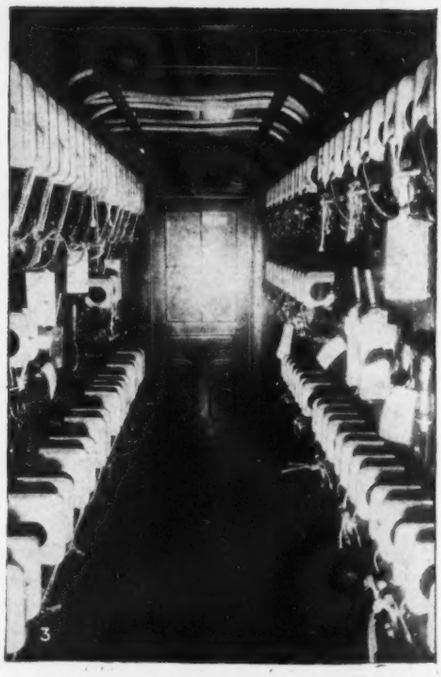
By comparison with the cathode-ray oscillograph it is found that the diameter of the Lichtenberg figures and the appearance of the record depend on the shape of the wave front as well as on the value of the crest voltage. Using the same value and shape of wave and a wide range of frequency, the variation in the indications of the figures may be as great as 25 per cent or more, according to this study. The data are quite conclusive for waves with a slow front, but are incomplete for waves of the steepness encountered on lines in practice.

But the klydonograph as a field-research instrument has proved highly valuable, and its lack of precision has been long understood. An accuracy of 75 per cent on a lightning stroke is at least 75 times as valuable as no measurement, and the factors dealt with in transmission are so relative that this accuracy may be considered quite good. The great value of the klydonograph lies in field research, and in this realm of application it has done and will continue to do an invaluable job. It may be said that it has enabled the industry to master lightning and surges on transmission lines.

New Bridge Cranes of the Inland Steel Company

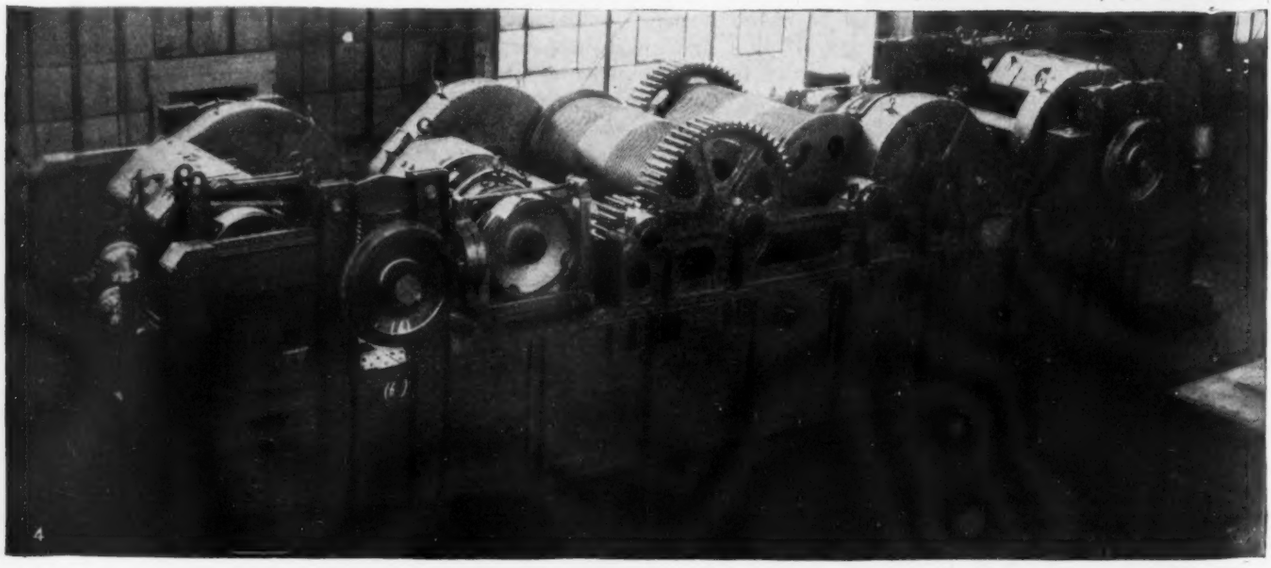






THE recent blowing in of two new blast furnaces at the Indiana Harbor plant of the Inland Steel Company, Chicago, marked the initial operations of the largest bridge cranes for the unloading of lake steamers that have ever been constructed in the United States, according to officers of the McMyler Interstate Company, builder of the cranes. The cranes are equipped with 15-gross-ton trolleys and buckets of the same size and have a center span of 265 ft. with a 65-ft. cantilever on one end and a movable apron extension of 99 ft. on the other end.

No. 1. One of the completed cranes.
No. 2. Bridge drive mechanism assembled in shop.
No. 3. Interior of control cab.
No. 4. Main trolley.



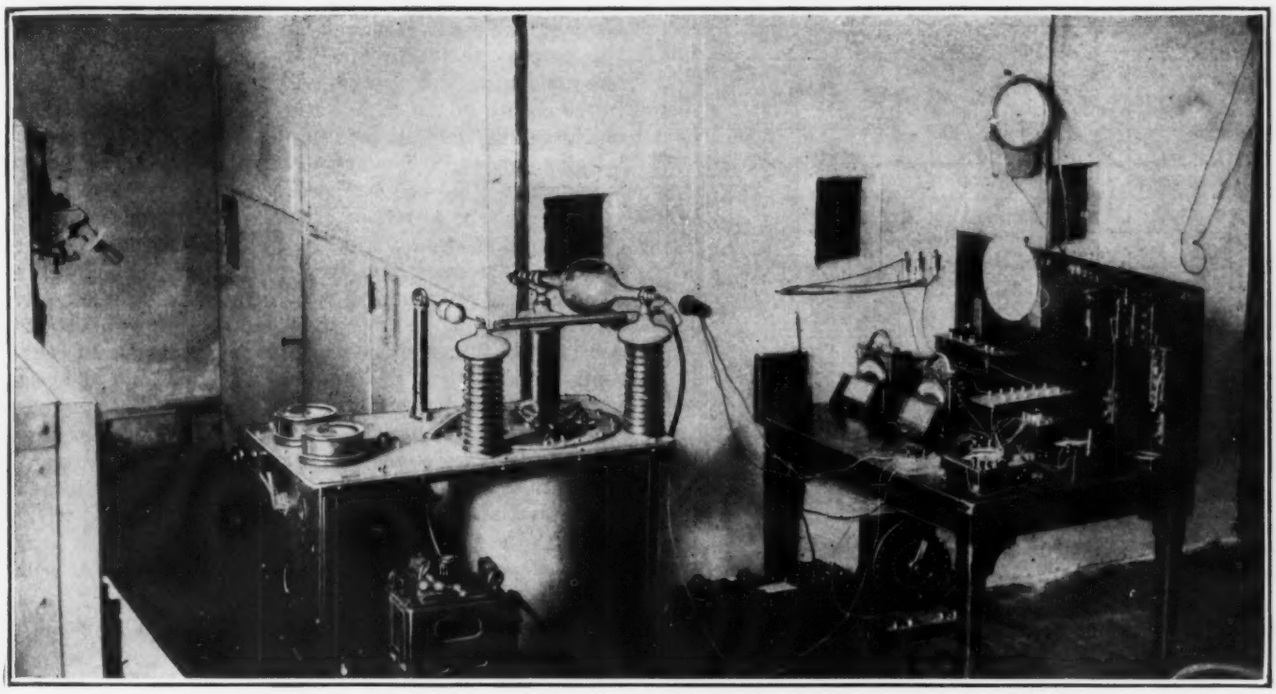


FIG. 1—KENOTRON OUTSIDE CONTROLLED TEMPERATURE ROOM

Kenotron Study of Cable Insulation Resistance

Relation Between Temperature and Leakage Current—Effect of Ionization and Voltage Changes—Ionization Voltage a Possible Impregnation Index

By D. E. REPLOGLE* and T. M. BURKHOLDER†

DESPITE the fact that the measurement of insulation resistance is one of the best established tests available today for insulation, this test is branded by most cable engineers as being very unreliable for determining the quality of impregnated paper cable. There are several reasons for this. First, any local defect in the insulation will probably not have any appreciable effect upon the insulation resistance of a long piece of cable. (In one case an experimenter cut a large hole clear through the insulation in a cable under test and was able to detect no difference in the resistance measurement after the insulation had thus been destroyed locally.) Second, the standard method of computing insulation resistance—that is, from the leakage current at the end of one minute electrification—is erratic. In many cases the absorption current is still quite large at the end of one minute and true insulation resistance is not obtained on this basis. A more logical method would be to base the computation upon the value of the leakage current after it reaches the steady state.

Another reason, not generally recognized, is that the insulation resistance of impregnated paper cable is a function of the applied voltage. This has been discovered since the kenotron rectifier, for testing cable at high-voltage direct current, came into use.

Some time ago, in connection with field tests with the kenotron on transmission cables of the Edison Electric Illuminating Company of Boston, this peculiar phenomenon was noted. It was found that the insulation resistance values obtained with the kenotron were consistently higher than those obtained by the usual method at low voltage. Further tests with the kenotron showed that the leakage current through the insulation was not proportional to the applied voltage. When plotted as insulation resistance against voltage, the resistance appeared to increase with increasing voltage. An investigation of this unusual characteristic of impregnated paper insulation was undertaken by the authors as a research problem at the Massachusetts Institute of Technology.

In order to determine the effect of temperature upon this phenomenon, a temperature-control room, large enough to house two reels of cable, was built. The walls were built with 2x4-in. studding covered on both sides

*Raytheon Manufacturing Company, Cambridge, Mass.
†Edison Electric Illuminating Company of Boston, Mass.

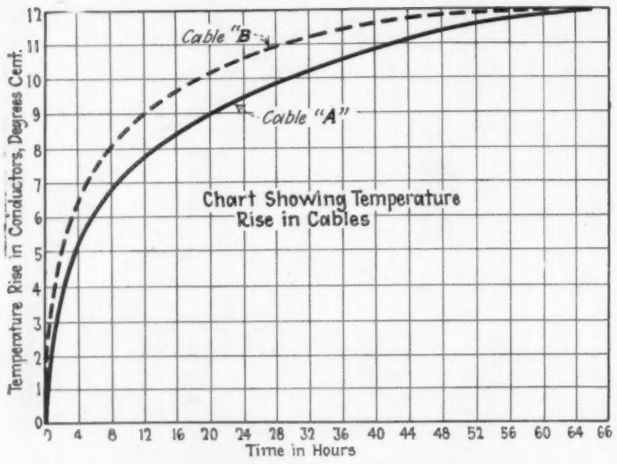
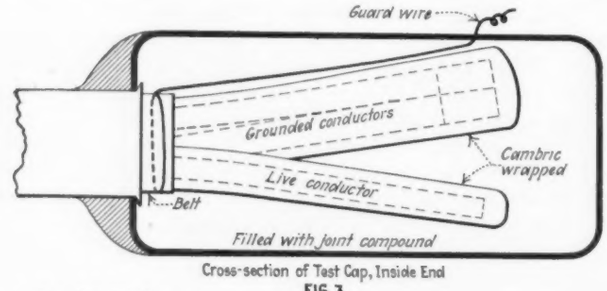


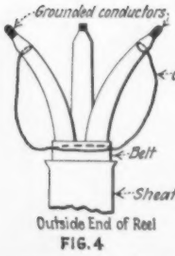
FIG. 2—TIME-TEMPERATURE CURVES OF TESTED CABLES

with wallboard. The space between was filled with sawdust to provide the proper heat insulation. By electric heating and a mercury thermostat it was possible to maintain a constant temperature in the room within 1 deg. C. It was interesting to note the time required for the temperature to become uniform throughout the cable when the constant room temperature was shifted through 10 deg. C. The resistance of the copper conductors was measured at frequent intervals by a sensitive Thomson bridge and the temperature of the copper was computed from these resistance values. Some experimenters have assumed that three or four hours' "soaking" at a constant temperature was sufficient to obtain uniform temperature throughout the cable, but it was found that 60 to 70 hours' "soaking" was required with the conditions described. This is shown graphically in Fig. 2.

Two reels of new 15,000-volt impregnated paper cable, bought under the same specifications but of different manufacture, were tested. Both were three-conductor, 350,000-circ.mil with $\frac{7}{32}$x$\frac{3}{32}$-in. insulation. Cable A, 644 ft. in length, was impregnated with a mineral oil compound; Cable B, 645 ft., was impregnated with a compound similar to that used in Cable A but mixed with resin oil. These two reels were placed in the temperature-controlled room and the ends prepared with the proper insulation for high-potential tests between one conductor and the two other conductors grounded to the sheath of the cable. Fig. 3 shows the connections on the inside ends inclosed in a lead cap filled with insulating compound. The arrangement of the outside ends is shown in Fig. 4.



Cross-section of Test Cap, Inside End
FIG. 3



Outside End of Reel
FIG. 4

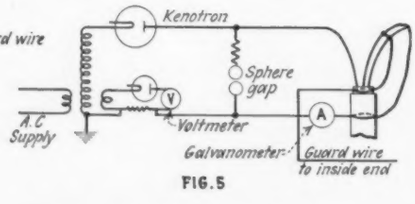


FIG. 5

FIGS. 3, 4 AND 5—TEST CAP, END OF REEL AND TEST CIRCUIT USED IN CABLE INSULATION STUDY

A single-tube kenotron rectifier outfit which supplied direct-current voltage up to 50 kv. was used. The diagram of connections, omitting details, is shown in Fig. 5. The voltmeter was calibrated to read directly in kilovolts supplied by the kenotron. Two portable deflection galvanometers were used to measure the current. When set at maximum sensitivity, one of these gave full-scale deflection at two microamperes and the other at ten microamperes. All of the current measurements taken were checked by both of these meters. These instruments with their shunts were calibrated before and after each series of readings. Guard wires were used on each end of the cables to shunt any surface leakage past the measuring instruments. A very constant source of alternating-current supply was obtained, and every precaution was taken to insure accuracy of results.

TEST PROCEDURE

The following procedure was used throughout the tests: A direct potential of 5 kv. was applied to the cable, as shown in Fig. 5, and leakage current readings were taken at intervals of two minutes until the current became constant. The voltage was then increased to the next voltage step and similar current readings were taken. This was continued up to an applied voltage of 50 kv. These tests were made on both cables at the following temperatures in the order given: 23 deg., 35 deg., 45 deg., 55 deg., 65 deg. and repeated at 45 deg. and 23 deg. C.

The actual insulation resistance, under any condition of temperature or applied direct-current voltage, is this voltage divided by the steady state leakage current. It was found that as the temperature of the cable was increased the time required for the leakage current to assume a constant value was greatly increased. This time varied from about ten minutes at 23 deg. C. to about 50 minutes at 65 deg. C., as shown in Fig. 6.

At a given temperature this steady state leakage current remained almost constant with increasing voltage up to a certain point. As the voltage was further increased there was a rapid increase in leakage current, and at still higher voltages the current became proportional to the applied voltage.

APPLICATION OF IONIZATION THEORY

The rapid increase in leakage current at a certain voltage may be explained by the accepted theory of ionization of the occluded gases. Before the ionization voltage is reached no current passes through these gas pockets, but when this gas is ionized at higher voltages, these voids offer comparatively little resistance to the current. This same effect has been found in tests with alternating current on impregnated paper insulation. If the voltage is increased to a point where the occluded gases are completely ionized, the insulation behaves like pure resistance and the leakage current becomes proportional to the applied voltage.

The phenomenon of constant leakage current at voltages below the ionization point is very interesting and

unusual. The only explanation that the authors have been able to find for this is that at a given temperature there are in the oil a certain number of free ions that are liberated by "free combustion" and not by any external stress. When a direct potential is impressed between conductors, these free ions have a tendency to migrate through the insulation to the conductors, depending upon their polarity. It is supposed that these ions are carried off as fast as they are liberated so that there is no accumulation of them even at the lower voltages. Consequently, as long as the impressed voltage is not great enough to produce further ionization, the current due to the flow of these ions will remain approximately constant for different applied voltages.

The fact that this phenomenon does not occur in alternating-current tests is significant. With the rapidly alternating voltage these ions would not tend to "migrate." If this theory is correct, then any connection that would give a longer path through the insulation would include more free ions and the current would be greater instead of less, as would be supposed from Ohm's law. This point is being checked by further investigation. The increase in the constant leakage current with higher temperatures, shown by the decrease in insulation resistance in Figs. 7 and 8, is due to the more rapid "combustion" of free ions at higher temperatures. From the data obtained it appears that this rate of "combustion" may be a function of the absolute temperature of the insulation. It has been shown that certain gases when acted upon by Roentgen rays possess this characteristic of passing a constant current with various values of impressed direct-current potential up to the point where the impressed voltage itself produces further ionization. Although this is a very different condition than that existing in a cable, it is interesting because the results are similar.

The results, plotted in the terms of true insulation resistance, are shown in Figs. 7 and 8. The almost straight line increase in insulation resistance up to a certain point is due to the constant leakage current throughout this range of voltages. The rapid decrease in resistance, corresponding to the ionization of the occluded gases, is shown clearly in these curves. In every case it appears that complete ionization is reached below 50 kv. As is rather well known, the insulation resistance decreases with increasing temperature. It appears that the voltage of ionization tends to increase with increasing temperature. This is probably due to the expansion of the oil and the correspondingly better impregnation that results. The effect of this expansion of oil is to reduce the size of the gas voids and to increase the pressure in them. It will be noted that the 55-deg., 65-deg., and the following 45-deg. and 23-deg. C. curves for Cable A show lower ionization points than those obtained in the first three curves. This is due to the fact that a considerable amount of oil was lost from the ends of this cable between the 45-deg. and 55-deg. C. tests. Cable B, from which no oil was lost, shows consistently higher ionization voltages at higher temperatures.

The authors believe that the value of the ionization voltage is important. Cable A was known to be more

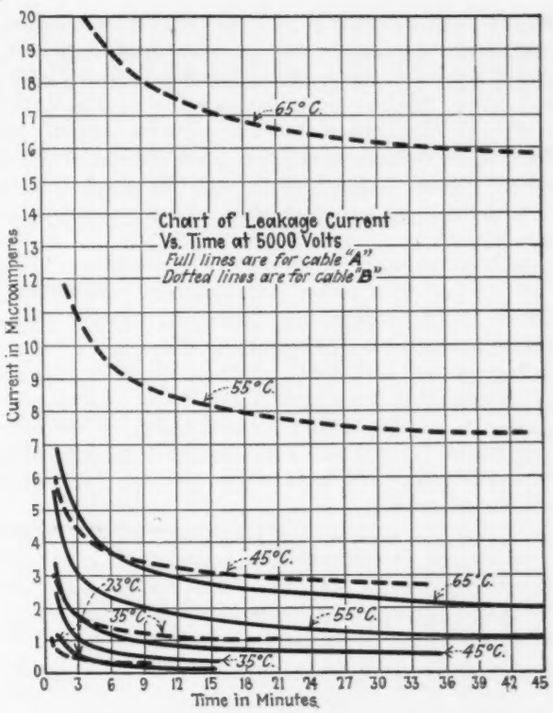
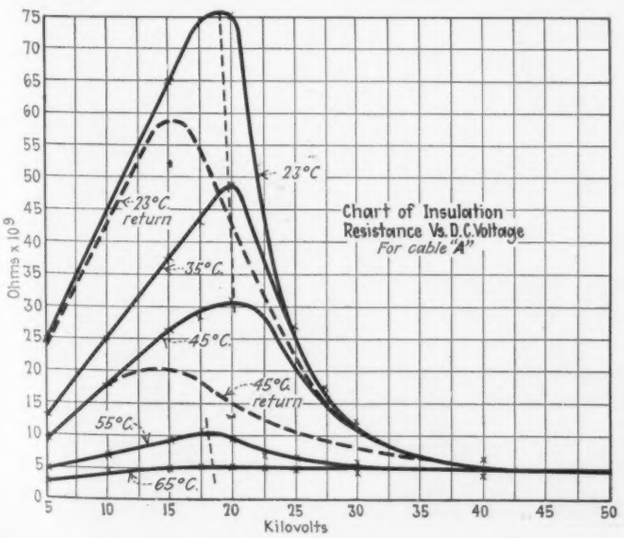
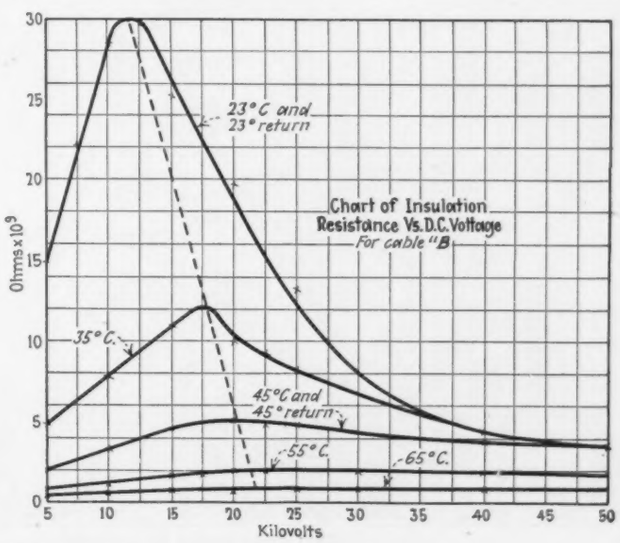


FIG. 6—EFFECT OF TEMPERATURE UPON LEAKAGE CURRENT-TIME CURVES





FIGS. 7 AND 8—RELATION BETWEEN VOLTAGE, TEMPERATURE AND INSULATION RESISTANCE

thoroughly impregnated than Cable B and its ionization voltage before the loss of oil was markedly higher than that of the latter cable. After the loss of oil Cable A showed about the same characteristics as Cable B in this respect. It appears that for a given type of cable the ionization voltage may be a good indication of the degree of impregnation. If this is the case, it should prove to be a very valuable test for the manufacturer and the operator.

These tests show further that true insulation resistance as applied to a given impregnated paper cable is a relative quantity depending upon the applied voltage and the temperature. If the computations are not based on steady state conditions, another variable is introduced. From this there appears to be no actual value of insulation resistance that we can assign to any given piece of cable. Any value obtained without knowledge of these variables will be of little use in determining the quality of a cable.

In treating the output of a kenotron rectifier as pure direct current it is realized that an error may be introduced. However, the values of leakage current were very small in comparison with the rating of the set and whatever ripple there might be in the direct-current voltage would be effectively smoothed out by the capacity of the cable. The only effect of any charging current due to a ripple in the direct-current voltage would be to shift the results a little in magnitude but not in their general characteristics.

The authors realize the limitations of any conclusions that are based on the results obtained on only two reels of cable. However, a large number of data were taken and the results appeared consistent throughout. When further tests prove, as indicated herein, that the ionization voltage at a given temperature varies with the degree of impregnation of the insulation, tests of this character would greatly aid the manufacturers and operating companies in determining the quality of cable.

Rainbow-Estes Plant at Ausable Chasm

AN INTERESTING hydro-electric plant is now under construction at the famous Ausable Chasm, New York, to supply energy to the J. & J. Rogers Company of Ausable Forks and to the Northern Adirondack Power Company and Bouquet Electric Company. The plant is being built by the J. & J. Rogers Company and is to be known as the Rainbow-Estes station. The construction of the power house and gatehouse is being handled by F. de P. Townsend of Grand' Mère, Canada, and it is planned to make the completed job one of the most attractive in appearance in the Adirondack region.

Three 1,500-kw., 2,300-volt General Electric generators will be direct-driven by S. Morgan Smith waterwheels. A reinforced-concrete dam about 540 ft. long and 12 ft. in maximum height has been built across the gorge a few hundred feet above the station site, and the station is served by a steel penstock 360 ft. long and 6 ft. in inside diameter. The station building is of reinforced concrete, and the operating room, as shown, will be provided with a sharply pitched steel-framed roof to insure snow disposal and a traveling crane carried on girders attached to the columns.

From the station 60-cycle, three-phase energy will be taken by four lines leading out for the Northern Adirondack Power Company through the steel structure behind the plant on the hill, and thence to a transformer installation where the line voltage will be raised to 13,200 for neighboring transmission. The lines of the J. & J. Rogers Company lead from the above-mentioned structure to transformers, where the voltage will be stepped up to 45 kv. for transmission 14 miles to the sulphite and paper mills of the Rogers company at Ausable Forks.

The engineers for this work were R. E. Horton, Voorheesville, N. Y.; Charles T. Middlebrook, Albany, N. Y., and H. K. Barrows, Boston, Mass.

RAINBOW-ESTES PLANT UNDER CONSTRUCTION AT AUSABLE CHASM

Electric Heating Load Grows Rapidly

Industrial Heating Load of Connecticut Light & Power Company Grows Twice as Rapidly as Motor Load—Data from Specific Industries Show Economic Value of Heating Business to Utility

By ROBERT M. KEENEY
Industrial Heating Engineer Connecticut Light & Power Company, Waterbury, Conn.

THE industrial electric heating load of many central stations in the United States is increasing at a more rapid rate than the motor, lighting, railroad or total loads. Ten years ago few central stations hand any industrial heating load, although large blocks of power had been absorbed during the previous 25 years in electric smelting and a start had been made in electric melting of steel. Today every central station has some industrial electric heating on its lines. In the large industrial centers the industrial heating load is second only to the motor load. A study of the load of the Connecticut Light & Power Company shows the trend of the central-station load toward industrial electric heating and also three successive stages of development of the heating load during the past eight years: (1) Melting, (2) oven heating, and (3) heat-treating, with a decided present trend toward electric heat-treatment of brass and steel.

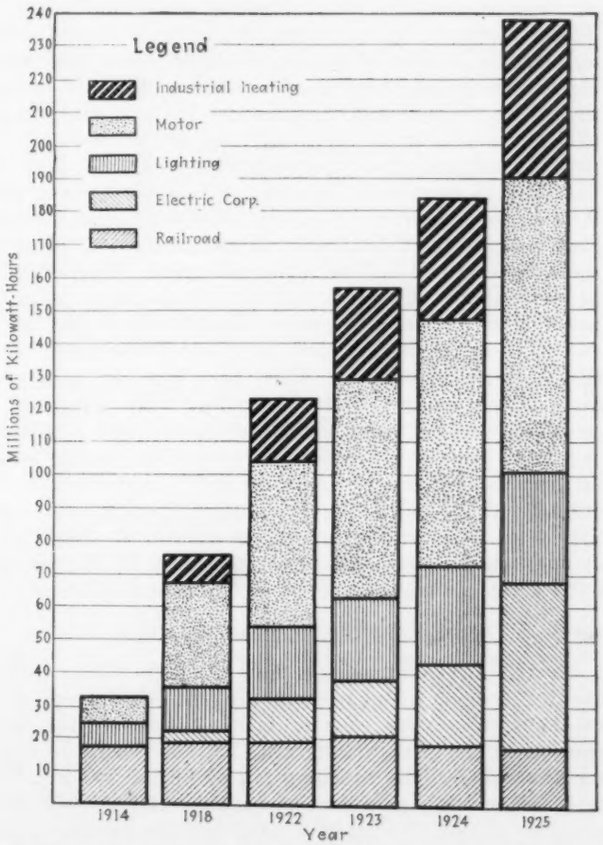
Twenty per cent of the total energy sales and 10 per cent of the total electrical revenue of the Connecticut Light & Power Company during 1925 were derived from the industrial electric heating load. These sales were 25 per cent of the total sales for commercial power, lighting and to railroad corporations. Of the total sale of 238,400,000 kw.-hr., heating consumed approximately 48,500,000 kw.-hr., with a connected load of 14,000 kw. and an estimated demand of 10,000 kw.

With the exception of sales to other electrical corporations, the industrial electric heating load was second only to the motor load of 88,500,000 kw.-hr., which was 37 per cent of the total. It exceeded the lighting sales of 33,400,000 kw.-hr. by 45 per cent and was 173 per cent greater than the railway sales of 17,700,000 kw.-hr.

440 per Cent Gain in Eight Years

The industrial electric heating sales are increasing more than twice as rapidly as the motor load. Sales have jumped from 9,000,000 kw.-hr. in 1918 to 48,500,000 kw.hr. in 1925, an increase of 440 per cent in eight years. During this period the sale of energy for motors has grown from 32,300,000 kw.-hr. to 88,500,000 kw.-hr., or 174 per cent. The lighting sales are 155 per cent greater, but the railway sales have fallen 10 per cent. The total increase of sales was 310 per cent. Heating maintained its higher rate of advance during 1925, sales increasing 34 per cent, whereas the motor sales increased 16 per cent and the total sales 29 per cent. This growth has been consistent and will probably continue for a number of years, with the possibility of eventually equaling the motor load.

The greater part of the electric heating load is in Waterbury, the brass center of the world, and in the "Hardware City" of New Britain. Seventy-five per cent of the heating kilowatt-hour sales were used in brass-melting furnaces, 19.5 per cent in heat-treating furnaces and 5.5 per cent in ovens and low-temperature heating equipment. Brass annealing required 6,350,000 kw.-hr. of the heat-treating load, Table I, and the heat-treatment of steel consumed the remainder.



ACCELERATING USE OF ELECTRIC HEAT IN METAL INDUSTRIES IN WEST-CENTRAL CONNECTICUT

The subdivision of the electric heating load among industries is shown in Table II, and Table III shows the use of the connected load.

At present there are being erected melting and heat-treating furnaces of 2,100-kw. installed capacity, with a probable annual consumption of 10,000,000 kw.-hr. Of this, two-thirds is melting and the remainder heat-treating. A total connected load of 7,000 kw. with a possible consumption of 22,000,000 kw.-hr. is under active consideration. Business to the extent of 3,000 kw. is promising and 4,000 kw. in the early stages of negotiations. The trend of the industrial electric heating load under negotiation is decidedly toward heat-treatment of brass and steel.

Although the electric melting load from the brass industry has by no means reached a saturation point, the heat-treating load has increased at double the rate of increase of the melting load during the past three years. As a result of the financial saving and improved product resulting from electric heat-treating, several concerns which installed trial furnaces two or three years ago have added to the equipment.

Two years ago a manufacturer of light seamless tubing installed one 330-kw. box-type furnace for annealing brass tubing and one year later a 210-kw. furnace for the bright annealing of copper tubing. The box-type furnace replaced a wood-fired muffle and the electric bright annealing furnace replaced a gas-heated furnace. These furnaces have proved so economical that two additional 330-kw. box-type furnaces have just been built, and it is probable that another electric bright annealing furnace will be purchased later. One result of the use of electric heat has been an increase of the power factor of the customer's load from less than 70 per cent to more than 90 per cent. With the completion of the present program the total connected furnace load will be 1,200 kw., and all annealing will be performed electrically. The furnace demand, however, will be only about 600 kw. Because of the slow rate of penetration of heat through a mass of tubing, the tubes do not absorb heat as rapidly as it can be released from the heating elements. With the heating elements divided into several control circuits, it is practical to operate with a demand regulator on each and a master regulator on a group of furnaces, which results in a material saving in cost of power and little reduction of output. Thus the heating demand will be 600 kw. and the motor demand 250 kw., or in a ratio of about two to one, which gives a general indication of the possibilities for electric annealing in the brass industry.

SAVINGS FROM ELECTRIC HEATING

Electric brass annealing will probably never cause the tremendous economy per ton resulting from the substitution of the electric melting furnace for the crucible in the brass-rolling mill, but the results to date are favorable. The consumption of 36,400,000 kw.-hr. in brass melting probably saves about $1,000,000 per year, or double the amount paid for the power. But before brass has reached a marketable form it may have been annealed five or more times, so that the tonnage annealed is many times that melted. Thus a saving of $1 per ton annealed may result in as large a total saving as $5 per ton of metal melted. Electric annealing of brass or copper tubing is $2 per ton cheaper than wood or gas annealing under local conditions of power at 1.7 cents per kilowatt-hour, wood $8 per cord and gas $1 per 1,000 cu.ft. A definite demand from the electric refrigerator industry has developed for electrically bright annealed copper tubing, because of its superior bending qualities.

What the small tube mill has done is possible in the large rolling mill. The single chamber tube-annealing furnace anneals brass with a power consumption of 100 kw.-hr. per ton. The large brass mill annealing hundreds of tons per day can possibly use the counterflow, recuperative furnace to better advantage. Such a furnace should anneal brass with a power consumption of 65 kw.-hr. per ton. With power at one cent per kilowatt-hour, an increment rate which the furnace would earn in a large mill on 24-hour operation, the heating cost is $0.65 per ton. The average oil furnace consumes about 8 gal. of oil per ton of brass annealed, giving a cost of $0.64 per ton, with oil eight cents per gallon delivered at the furnace. Breaking even on heating cost, the electric furnace operation has many features that make its use advantageous to the rolling mill and result in a reduction of the annealing cost: (1) Less oxidation of metal; (2) a much lower acid consumption in pickling; (3) less time required for pickling; (4) a considerable saving in labor; (5) a reduction of the unaccounted metal loss; (6) improvement of working conditions, and (7) a uniform product with elimination of rejections on the finishing anneal and the possibility of repeating the furnace conditions day after day, with no variable affecting the operation.

Application of electric heat-treatment is progressing steadily in the hardware industry. After two years of operation of several large electric furnaces for annealing steel, one concern has found the electric annealing furnace more economical than producer gas- or coal-

TABLE I—INDUSTRIAL ELECTRIC HEATING LOAD
The Connecticut Light & Power Company, 1924–1925

	Connected Load, Kw.		Demand, Kw.		Yearly, Kw.-Hr.	
	1924	1925	1924	1925	1924	1925
Melting	5,875	8,520	4,400	6,020	28,000,000	36,467,500
Heat-treating	2,825	4,060	1,700	2,610	6,100,000	9,398,000
Ovens and miscellaneous	1,120	1,428	1,070	1,354	2,140,000	2,697,500
Total	9,820	14,008	7,170	9,984	36,240,000	48,563,000

TABLE II—INDUSTRIES USING INDUSTRIAL ELECTRIC HEATING

Industry	Number of Plants	Melting, Kw.-Hr.	Heat-Treating, Kw.-Hr.	Ovens and Miscellaneous, Kw.-Hr.	Total, Kw.-Hr
Ball bearing	2	.....	600,000	.....	600,000
Brass	7	35,800,000	6,370,000	.....	42,170,000
Novelty	3	.....	50,000	.....	50,000
Button	3	.....	20,000	325,000	345,000
Hardware	8	667,500	2,170,000	1,501,500	4,339,000
Miscellaneous	12	.....	188,000	871,000	1,059,000

TABLE III—USE OF CONNECTED HEATING LOAD IN 1925

	Ratio Demand to Connected Load, Per Cent	Average Load in Kw.	Ratio of Average to Connected Load, Per Cent	Load to Demand, Per Cent
Melting	70.6	4,170	48.8	69.30
Heat-treating	64.1	1,070	26.3	41.0
Ovens and miscellaneous	94.8	307	21.5	22.6

fired annealing furnaces, because of the improved quality, the elimination of rejected batches that clogged production and required further heat-treatment, the big reduction of maintenance costs and the ability to control the atmosphere of the furnace more readily.

The hardening of small steel parts in a box-type electric furnace saves $7.20 per ton in comparison with gas-heated, rotary drum furnaces operated by one manufacturer. The power cost is 1.7 cents per kilowatt-hour and the gas cost is $1.12 per 1,000 cu.ft. Production from the electric furnace has been maintained at 700 to 800 lb. per day for more than a year. During this time the furnace has earned its entire initial cost and has produced no pieces that did not pass a rigid inspection. When operated by the user in regular production, on test against a box type of gas furnace, which was much more efficient than the rotary drum furnace, the electric furnace was superior in several respects, as follows: (1) Cost of power was $1.60 per ton less than cost of gas; (2) electric furnaces had a 30 per cent higher hourly production; (3) the electric furnace eliminated all rejections, and (4) the labor cost per ton is less with electric furnace operation.

The ease and safety with which an electric furnace

can be installed in the line of production regardless of the location in the plant are illustrated by the recent application of two electric cyanide pots to the hardening of tools on the fifth floor of a factory building. Formerly the formed tools were taken to gas-heated pots in the basement for hardening and then returned to the fifth floor for finishing and packing. The tool has been improved by electric hardening, consistently uniform results are being obtained and the saving in haulage is paying for the investment.

These successful initial electric heat-treating installations in the brass and hardware industries and further consideration of the large potential heat-treating load in the territory strengthen the thought that the application of electric heat is just getting started in the metal-working industries of Connecticut. With the heat-treating load having the greater possibilities and increasing at double that of the melting load and total industrial electric heating sales increasing twice as fast as motor kilowatt-hour sales, the question arises, "How soon will the heating load equal the motor load?"

The industrial electric heating load is increasing at such a consistent rate that its equaling the motor load seems simply a question of time. Forecasts many years ahead are uncertain, and in using such curves one should always recall that they are based upon the past and upon conditions that might be changed in the future by some unforeseen event. The possible electrical load for annealing in the brass industry alone surpasses the present total motor load. Electric heat-treatment has become a method of such proved worth among operators familiar with it that its intrinsic value will sooner or later result in its becoming the most used method of heat-treatment in the brass- and metal-working industries.

If the present rate of increase continues, the industrial electric heating load will equal the motor load in 1931. As 1925 was a year of marked increasing business activity, it is possible that the present rate of increase will not continue and that the industrial electric heating load will more likely equal the motor load some time between 1930 and 1940.

Radio Interference

Man-Made Interference Largely Controllable, but the Extent and Method of Suppression Must Depend on Economics of Situation—Experiences with Locating Interference Related—Test Equipment Described and Causes of Interference Discussed

By ROY B. ASHBROOK and RALPH W. WIGHT
Southern California Edison Company

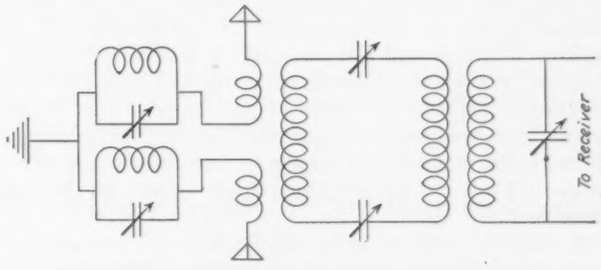
THE subject of radio interference may, in a broad sense, be segregated into two general classifications. The first covers all interferences due to natural causes over which man has no control, such as static or atmospheric disturbances in general. The second classification includes what is termed "man-made" interference and deals with all forms of interference-creating apparatus or equipment developed for the generation and distribution of electrical energy.

Man-made interference is, to a certain extent, controllable at its source. However, in some instances the suppression of such interference would prove very expensive. In the past few years a great deal has been done within the radio transmitter itself to reduce interference by the suppression of harmonics and the confining of the high-frequency energy to the band necessary for the desired transmission.

With the constant development of electricity, the telephones, telegraphs, street railways, signal systems, motors, etc., have made steady progress, as have the generation, transmission and distribution of electrical energy. During this period of development a great quantity of apparatus was manufactured and has been in service for many years. This equipment has been operating in a satisfactory manner electrically, but, due to the aforementioned sensitivity of radio receivers, some are now inherently sources of radio interference. Quite lately the manufacturers of such apparatus have interested themselves in the radio interference problem and are designing new apparatus free from interference-causing characteristics. They are also developing filters to eliminate the trouble in old equipment.

Contrary to the general impression, the presence of high-voltage transmission lines does not necessarily indicate that radio reception will be materially interfered with in its immediate vicinity provided metallic bodies within the field are properly bonded or so constructed or insulated from one another that a static discharge does not take place.

Several tests have been made directly beneath transmission lines up to 220,000 volts with excellent reception



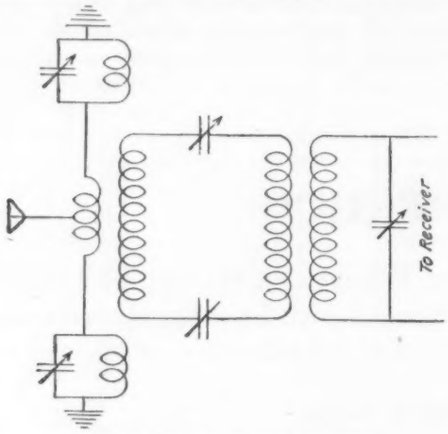
FIRST FORM OF TRAP RECEIVER FOR BALANCING OUT UNDESIRED FREQUENCIES

and no interference providing the voltage of the line does not greatly exceed the corona point.

The receiver was, in this case, properly shielded from low-frequency inductive effects. In one test a single wire antenna 1,100 ft. long was placed parallel to and 17 ft. from one conductor of the 220,000-volt line. A choke coil provided a low-resistance path to ground for the static potential and a high impedance to radio frequencies. Very satisfactory reception was secured

over a band of wave lengths ranging from 8,000 meters to 25,000 meters. A shorter antenna produced like results from 100 meters upward. Of course, this does not apply when there is some discharge taking place that does cause interference but indicates merely that the presence of high-tension transmission lines does not necessarily mean that radio reception will be interfered with.

In the year 1920 the Southern California Edison Company decided that the only practical means of communication between headquarters camp and construction camps on the Florence Lake Tunnel project in the High Sierras was radio. Five radio stations were constructed and placed in successful operation. A short time later the first radio interference problem of any consequence presented itself. One of the most important stations became affected by interference which made its operation practically impossible except by relay. The interference in question was caused by a direct-current generator supplying power to the trolley for operation of the tunnel locomotives and also by a defective 30-kv. transformer bushing. Snow conditions made it impossible to transport another generator for replacement, and load conditions made it impractical to take the 30-kv. line out of service to replace the transformer bushing. For these reasons it was decided to make an attempt to minimize the effects of the interference to the radio receiver.



SECOND FORM OF TRAP RECEIVER

Assuming that the receiver was affected by shock excitation due to the proximity of the antenna to the trolley (150 ft.) and also to local secondaries, it seemed feasible that as the interference was not resonant at a frequency within the range of the receiver, if the receiver were well shielded and receiving no energy except through the antenna, it would be possible to provide a balancing out circuit for everything except the desired frequency.

A receiver was constructed in a heavy copper box containing all batteries and equipment. Assuming that if two antennas were identical and received the same exposure to the interference and were connected oppositely to a secondary equally balanced to the antenna coils, the incoming current would flow in opposite directions and balanced out. If one antenna were provided with a trap resonant at a certain frequency, an unbalance would occur at that frequency and induce a potential in the secondary at that frequency only.

A modified circuit was finally tried out utilizing a single antenna and a balanced coil with a center tap. With this arrangement it was found that the desired signal was reduced approximately 60 per cent, whereas the interference level was reduced to practically zero. However, reliable communication was possible where it had been impossible before. This experience is presented to illustrate that although radio communication was very important to us, it did not justify the discontinuance of the use of the generator or the delay necessary to change the 30-kv. bushing. Much can be done in the location of antennas and lead-ins to minimize coupling with power circuits. We believe the above was our first case of radio interference.

In the past two years attention has been drawn to the use of radio in the home by the ever-increasing number of complaints received of power line interference to radio reception. An honest endeavor was and is being made to investigate and eliminate such trouble as is caused by our lines or equipment. Very little was known concerning the locating and correcting of trouble of this nature, but experience points out that this type of interference divides itself into two classes: That which originates in appliances or other equipment which is the property of the consumer and over which the central station has no control and that which originates on its lines and equipment for which it is directly responsible. Several methods for locating radio interference on the power lines were given consideration, but the most satisfactory results were obtained by using a method of measuring volume of interference to try to locate the maximum point. The assumption was that the trouble would be in the immediate locality of the maximum volume.

VOLUME TEST FOR LOCATING INTERFERENCE

The most successful results have been secured by using a portable superheterodyne in conjunction with some method of measuring volume. The constant impedance audibility meter was first used for this purpose, but later a system was developed to give a visual reading instead of an audible reading. This is a very desirable feature, as it eliminates the necessity of wearing head phones and has no dependence on the extremely variable qualities of the human ear. The circuit is shown in one of the drawings. The tube used is a standard "A" tube with 67½ volts on the plate, a variable "C" battery and normal filament voltage. The circuit is the usual vacuum tube voltmeter circuit. A potentiometer is used with the "C" battery to adjust the plate current as registered on a 0-10 milliammeter to zero when no signal or interference is present.

When an interfering noise is tuned in, the voltage impressed on the grid of the tube will cause a deflection on the milliammeter, the amount of which is governed by the strength of the interference.

In taking readings along a line, it will be found that many misleading readings will be secured. Readings are greatly affected by the height of the poles, the proximity of ground leads, location of switches, taps, etc. All readings must be taken as nearly under like conditions as possible. Even then it will be found that there are nodes in the noise level along the line. It is believed that these nodes are due to reflection from various taps on the circuit, but as yet this theory has not been definitely established.

Much radio interference has been attributed to "leaky" insulators and transformers. It has been our experience that very few cases of power line interference to radio can be attributed to these causes. Approximately 90 per cent of our troubles are due to what

we term "static" leaks. It is a well-known fact that any body of metal in the field of the high-tension line but not connected to it will become charged. Should this body of metal be placed near enough to another such body or a ground lead, a discharge would take place, causing interference depending upon the magnitude and voltage of charging current.

The improper placing of crossarm braces, transformer hangers, switch hangers, fuse holders, bolts, washers, nuts and even staples, as well as placing of ground leads and bonding wires, is likely to cause "static" leaks. These so-called leaks did not interfere in any way with the distribution of power and their presence was not known until the advent of radio. Generally speaking, conditions such as loose connections, etc., will make themselves evident by more severe indication than radio interference.

When conditions permit, it has been found advantageous to assume that a given disturbance creates a field in all directions within a short radius from its source, although a large proportion is propagated a great distance over the power circuit similar to "carrier." With this assumption the loop is placed at right angles to the line and the amplification adjusted to a value that the disturbance is just audible or visible as the case may be. A survey is then made with the loop in this relation to the line, and when the observer comes within the field of the disturbance a material increase is effected. Readings at intervals are also taken with the loop parallel with the line to determine whether the observer is approaching or working away from the source of disturbance. Circuits or taps leaving the line must be taken into consideration.

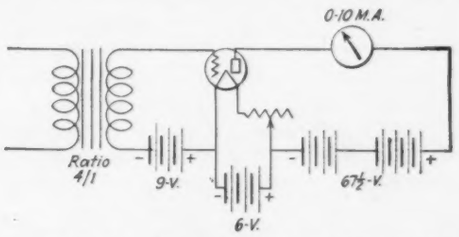
Experience has shown that the greater per cent of the interference is caused by 10-kv. and 15-kv. distribution lines. These circuits usually form an extensive network and are arranged with switching facilities for interconnection of circuits, consequently employing a great number of pole top switches, which are a source of numerous cases of interference. It has been noted that the trouble is not usually in the electrical circuit of the switch, but usually, if the bearings of the switch fit loosely, a static discharge takes place between the hardware and the cross-bar to which the blades are fastened.

Other cases frequently found in distribution lines of this class are poor connections in fuse clips, causing small arcs, loose ground connections, cracked transformer bushings and punctured windings, causing static discharge to core.

Very little interference has been experienced with lines constructed on steel towers with the exception of a few cases of defective insulators and poor connections in clamps. This is due to the fact that all parts of the tower and hardware are effectively tied together and offer no opportunity for static discharge.

Under the heading of sources of radio interference for which the power company cannot be held responsible come all appliances or apparatus which are property of the consumer and which are connected to the secondary system. Under this particular classification come all electromedicinal machines, mechanical rectifiers, vibrating frequency changers, all applications of the thermostat to automatic regulation of various appliances, electric welders, electric furnaces, electric sign flashers, electric elevators, small brush type motors, smoke and dust precipitators, street railway machinery, wig-wag warning signals for railway crossings, telegraph key clicks, automatic telephone apparatus and many other things far too numerous to list here. Many of the manufacturers of equipment that cause radio interference are spending considerable time and money toward the development of suitable filters or toward the redesign of their equipment to eliminate the troublesome features. Much progress along these lines has been made by several companies in the development of the thermostat to assure a clean quick break of the electrical circuit, thereby eliminating the former arcing.

Another notable instance of progress along the line of reduction of radio interference is the development by the Cottrell Precipitator Company of a filter to eliminate successfully trouble caused by its smoke and dust precipitators. Local telephone companies have also developed filters to control a great percentage of their interference, but there still remains much work to be done on many types of electrical apparatus. Greater progress will be made when manufacturers of



CIRCUIT FOR MEASURING VOLUME OF INTERFERENCE

interference-causing equipment are brought to realize their responsibility and accept it as such. An honest effort should be made on the part of every manufacturer to correct such conditions as affect his own equipment. Co-operation is the essence of success where such a vast number of things contribute to the total interference level.

In conclusion, it should be stated that in any section where there is a serious amount of interference it is essential that the listeners exert every possible effort to locate the trouble before appealing to the power company. It is not reasonable to expect the power company to investigate all cases of interference, as statistics show that approximately only 50 per cent of the trouble reported to and investigated by the power company can be traced to equipment for which it is directly responsible. Time spent by the power company in investigating interference which it is not responsible for deprives it of much time which might have been spent in eliminating trouble on its own lines.

Electrical Progress in the Belgian Congo

THE Société Coloniale d'Electricité of Brussels, which operates the central electric power stations at Elizabethville and Kinshasa-Leopoldville in the Belgian Congo, has lately secured a concession for the supply of power for lighting and power purposes to La Panda, a growing industrial center in Katanga. Application has also been made that the company should extend its operations to the port of Albertville. At Elizabethville the company is already supplying electricity to 700 customers, and it is expected that the number will be increased to 900 before the end of the year. In the Kinshasa and Leopoldville districts the number of consumers is steadily increasing.

Some Problems Confronting the Young Engineer

Experiences and Impressions of an Engineer Who Has Been Out of College Four Years—Question of Technical Graduate's Immediate Value to His Employer

By F. C. SMITH
Production Department, Alabama Power Company, Birmingham, Ala.

AFTER reading carefully various articles by men prominent in industry concerning "the young engineer" I am prone to believe the old adage, "Time tempers pain."

Take the widely discussed subject of salary. It has often been said that with respect to beginners in other professions the engineer is overpaid. The young engineer gets about $100 a month, whereas the lawyer or doctor is satisfied with from $40 to $60. Analyzing this, we find that the young technical man goes into the field for training where he does actual work, usually replacing skilled labor at a higher rate than his own. Whether this work be operating a steam shovel, tracing and sketching in a drafting room, operating a steam turbine, firing a boiler or building a transmission line, the student in this field is doing work of immediate value to his employer while training for the better jobs. On the other hand, the young lawyer spends months reading in the library and listening in on cases of his senior associates in law, having but little opportunity to contribute his personal efforts to productive work, and the doctor is also barred from active practice of his profession for several years.

The young engineer should be paid whatever his job is worth and should be helped to become of greater value. The older man must remember that when he pays his juniors $100 a month this is equivalent to less than $50 at the time he (the older man) was getting his training.

Employers are principally interested in students who rank among the first 40 per cent of the class, based on grades and general standing in college. The lower 60 per cent gradually drift into other fields or fill routine, mediocre positions in engineering or allied work. As an exception to this general statement it is worth while to mention the extremely bookish impractical type who makes high grades but who must be eliminated from this consideration.

Of the 40 per cent, the industry is very much concerned with the more capable ones who have such active minds and good personality that they can readily adapt themselves to work in allied fields, not specifically engineering, which pay more. Financial investigation and engineering salesmanship are occupations that have drawn heavily on this group. The large company employs picked students whom they consider the very best available and then often make the training course so long and promotion so slow that a large number of the most capable and more energetic boys go into other fields and are thus lost to the industry to which they could be of most value. This condition tends to maintain the present relative wage scale between the strictly technical man and those more directly concerned with finance.

"Select a job that you like and train for it" is the usual advice in the papers I have reviewed. This point is certainly well taken if due consideration is given to what a man likes in the way of work. However, the mere fact that a graduate enjoys calculations does not mean that he wants to be a designer, and I certainly would not recommend that a man who is naturally adapted to engineering take up teaching merely because it pays more money at the start. A man's pleasure in his work is determined largely by his ability to do the job well, the appreciation of his associates and superiors and pleasant surroundings. With the exception of "freaks," no man enjoys work that does not return a comfortable living, and the mere fact that he does his work well is no consolation unless he knows that it is essential and recognized.

Young engineers should and for the most part do realize that it is essential to get into the field and do a large amount of manual work and be in direct contact with the people doing actual construction and operating work. This not only gives them a grasp of the practical side of engineering but it also furnishes an opportunity to learn something of labor problems and handling men that cannot be gained in any other way. However, the young man and his superiors alike should realize that his advancement depends largely on the associations and contacts formed with men higher up in the organization, and whenever the young man is so located that he loses this contact, he is "marking time." In most cases his field work should be followed and guided by older men of some prominence who have in mind not only adequate training for the apprentice but using him when a better position is available. I am inclined to think that field training should be more or less laid out to fit him for a certain department. This can be done only in case the young engineer is able to decide early what branch of engineering to enter.

YOUNG ENGINEER LACKS CONFIDENCE

The beginner is more apt to underestimate himself than not. He is accustomed to the guiding hands of his professors, who have studied his troubles and given their entire time to his advancement. I believe any engineer will agree with this statement if he will think back over the time when he first tackled a practical job. Even if the work is well understood, the feeling of responsibility and the fact that he has not done the work before make him call for much more advice than he really needs, and his superior feels that he could have done the work himself easier than he could coach the student. With this in view I think the younger man needs to be encouraged by a good word whenever his performance will permit.

Finally, the young engineer must watch his social contacts. If a young man gets in the wrong current of outside affairs it is very damaging. He must also avoid the appearance of trying to push in where he is not wanted. Settling down in isolated locations for indefinite periods is seldom to the advantage of an ambitious engineer, because it precludes the possibility of social life, society meetings and other means of making advantageous acquaintances.

There has been a general opinion that the young engineer just out of college must pass through an unproductive, unremunerative period of from three to ten years before he can be given essential and responsible work. This attitude is gradually passing and young men are being given more responsible positions where they can earn their salary and at the same time enlarge their experience and prepare for the next step of the ladder.

The Automatic Secondary Network System in Memphis

Original Underground Distribution System Changed Over with Minimum Waste of Cable and Equipment Already Installed — Interconnected Three-Phase, Four-Wire Secondaries Insure Continuity of Service

THE underground area in the city of Memphis, Tenn., comprises a total area of approximately 120 blocks. Rapid development in this area in the past few years with many new office buildings, hotels, and theaters made the then existing distribution system entirely inadequate, and the duct lines became congested with the cables of several different types of distribution. In planning the rehabilitation and consolidation of the various types of systems the condition and quantity of existing cables and transformers necessarily had great weight in the problem of selecting one system that would be most satisfactory from the standpoint of economy and reliability of service.

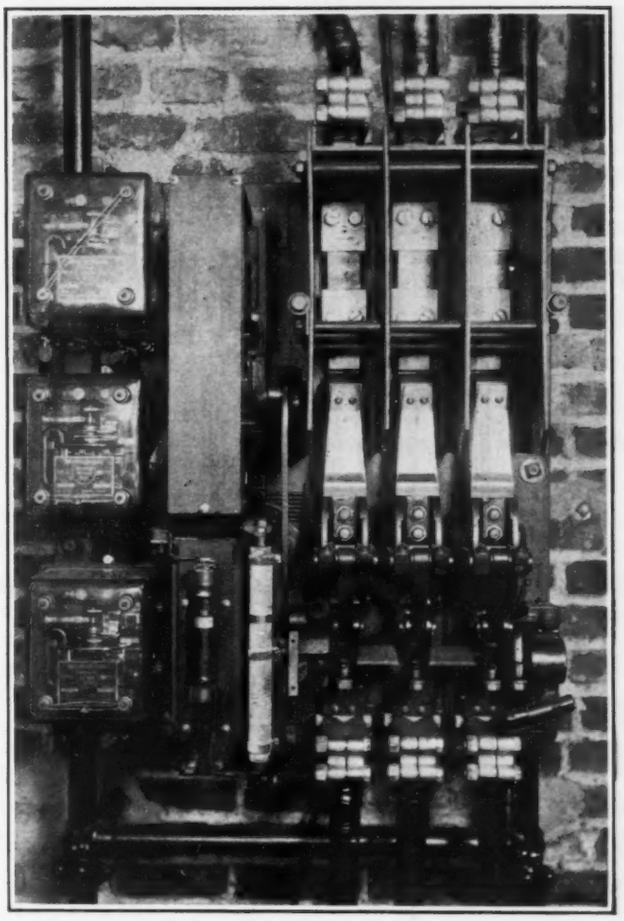
The underground system was being served from a generating station and a substation located approximately two and a quarter miles apart at opposite ends of the district.

Seven four-conductor feeders and two 6,900-volt feeders tied these stations together. In addition to these seven feeders there were three 2,400-volt, three-phase feeders serving mostly three-phase power loads. Three secondary systems were being used—namely, three-phase, four-wire, 115/200 volts combined power and lighting network; three-phase, three-wire, 230-volt line for power, served from banks of open delta connected transformers, and the single-phase, 115/230-volt lighting mains. Two direct-current systems were also in operation, but their gradual elimination is planned The conduit system is quite extensive, consisting of two separate systems paralleling each other on streets and in alleys. Since the consolidation of the Merchants Power Company and the Memphis Gas & Electric Company these conduit systems have been extensively interconnected.

After careful consideration of the value of the existing cables and transformers it was deemed advisable to continue the 2,400/4,160-volt system for primary distribution and eliminate the 2,400-volt delta power circuits. When this cable and equipment have depreciated to such an extent that their usefulness are impaired, it will then be possible to consider replacing the system with one of a higher voltage. Of the available means of secondary distribution, it was decided to continue the three-phase, four-wire, 115/200-volt lines, eliminating the single-phase, three-wire lighting and the three-phase, three-wire, 230-volt power system by transferring all services to the three-wire network.

The reconstructed underground distribution system now consists of six 2,400/4,160-volt circuits running only from the new Beale Street station. In laying out the new feeders and distributors use was made of practically all of the conductor cable of the old system, a large part being utilized without removing it.

Where large or concentrated loads are encountered,



OPEN OR VAULT TYPE 800-AMP. AUTOMATIC NETWORK SWITCH USED IN MEMPHIS SYSTEM

as in large hotels, office buildings and theaters, the transformer capacity requirements are split into two or three banks, each being connected to a different primary circuit, so that the failure of one primary circuit causes only the loss of one-half or one-third of the total transformer capacity installed to serve the building and the necessity of extra-heavy secondary networks is avoided, it having been determined that the remaining transformer capacity with reasonable assistance from the network will be sufficient to render good service during such an emergency.

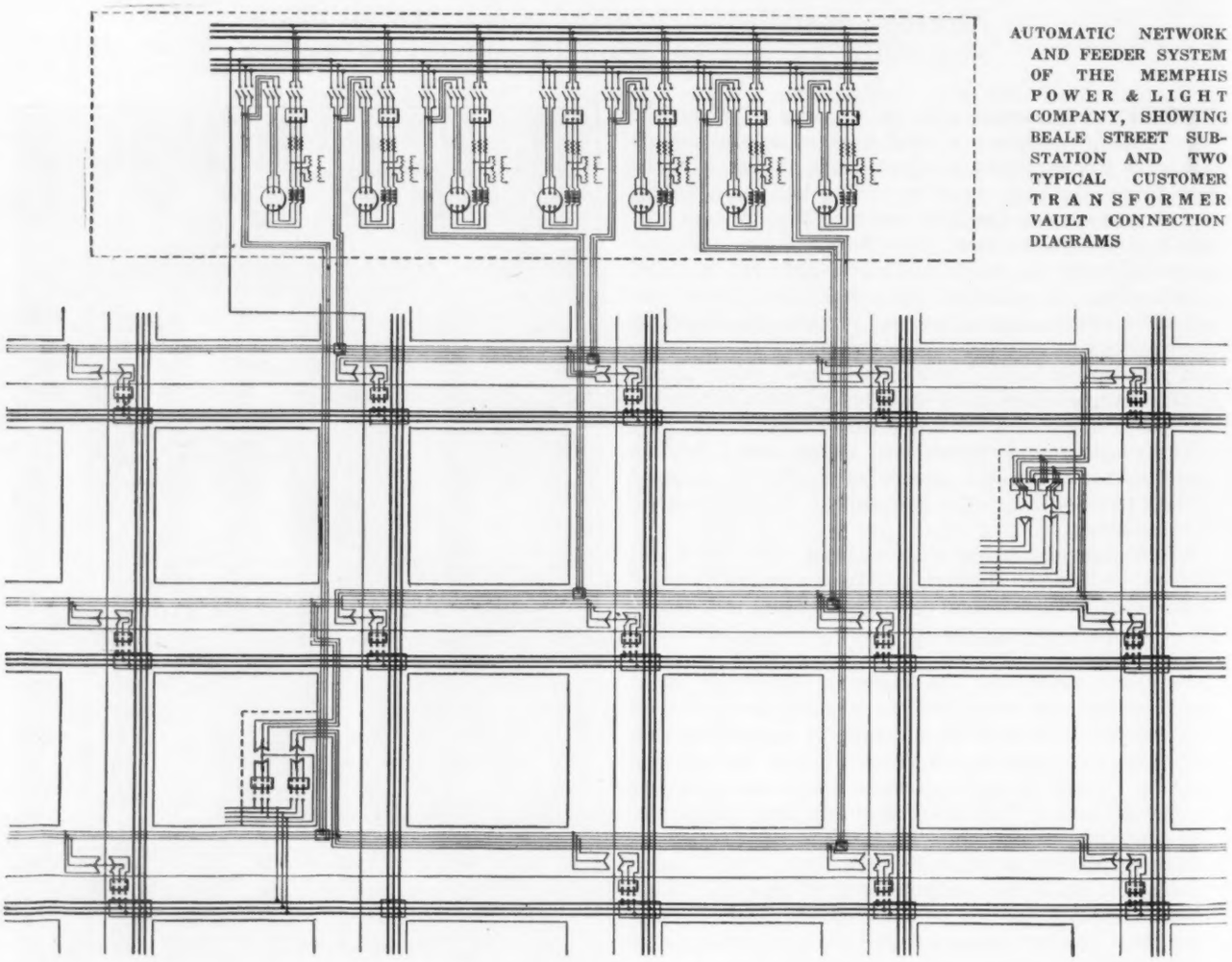
AUTOMATIC SECONDARY NETWORK SYSTEM

The Memphis automatic secondary network system is similar in principle of operation to the recently developed general type of low-voltage networks that are now being adopted in several other cities. The secondary

mains are interconnected to form a network similar to that of the familiar direct-current system. The network is fed by a comparatively large number of banks of transformers energized from the high-voltage feeders.

In the event of a transformer or primary cable failure the automatic network switches of all banks of transformers connected to the primary circuit in trouble as well as a station circuit breaker will open, and the whole unit—consisting of feeder, distributors and transformers—will be disconnected from the system, leaving the service throughout the secondary network intact, since the other primary feeders and their transformers will not be affected. After the trouble is cleared and the voltage restored the automatic network switches will reclose, reconnecting the transformers to the network system. If the phase relations of the circuit in trouble and the network should be changed in repairing the line, the switches will remain open until the proper phase relations are restored. The switches will also remain open until the voltage of the transformer secondaries is slightly higher than that of the network, so that the flow of energy will be from the transformers into the network. By opening the feeder switch in the substation the automatic switches of that circuit will open, due to reverse energy transformer magnetizing current, thereby making it possible to kill a primary circuit at any time without having to disconnect each individual main.

Through the use of the network system the necessity of primary switches, junction boxes and transformer fuses, all of which in most installations where they are used have been found to be a greater source of trouble than the cable or transformers, have practically been eliminated. Only one junction box is provided at the terminal of each main feeder, where the circuits branch in two directions, for the convenience of disconnecting one-half of a circuit to make repairs to cables or add extensions and at the same time keep the other half of the circuit in service.

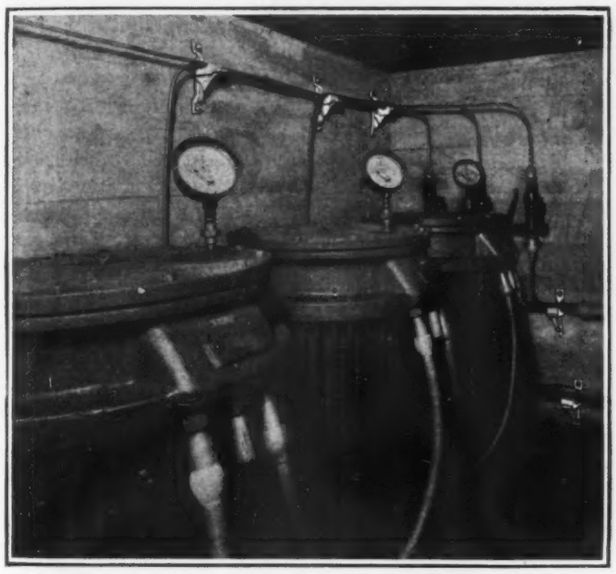


AUTOMATIC NETWORK AND FEEDER SYSTEM OF THE MEMPHIS POWER & LIGHT COMPANY, SHOWING BEALE STREET SUBSTATION AND TWO TYPICAL CUSTOMER TRANSFORMER VAULT CONNECTION DIAGRAMS

A high reactance is desirable for transformers used in this network system in order to cause the various transformer banks to divide the load in proportion to their capacities. The higher reactance reduces the power factor of the load as it passes through the transformers and correspondingly increases the demand charges for losses; however, it has been found that the reduction of transformer capacity practically offsets the additional demand charges for losses caused by the change in power factor by reducing the total amount of magnetizing current losses.

There were a few large power installations, such as newspaper printing presses, refrigerating machines and large elevator installations where special conditions

seemed to warrant providing a special bank of transformers, connected three-phase, 230-volt, delta secondary, served with two primary circuits, one for emergency and equipped with a primary automatic change-over oil switch. All large office buildings are required to provide for a three-phase, four-wire lighting service in order to facilitate balancing the network system. In many cases where the power load is comparatively small their switchboards consist of only one three-phase, four-wire bus, and power is served from the three-phase wires. In cases where the power loads are of considerable proportions, separate power and



TRANSFORMER MANHOLE, SHOWING TRANSFORMERS, THERMOMETERS, DISCONNECTING POTHEADS AND PORCELAIN CABLE RACK INSULATORS

light services are installed from the transformer vault network bus to the customer's separate power and light switchboard.

Automatic Secondary Network Switches

Each bank of distribution transformers of the network is protected on the secondary side by a three-pole, automatic carbon circuit breaker, which is closed and tripped open electrically through master relays. In addition to the usual potential and current coils of the induction type reverse power relays, this relay has a set of so-called phasing coils. These coils are connected directly across the circuit breaker contacts and are, therefore, in circuit only when the breaker is open, really serving the same purpose as the current coils when the breaker is closed. The automatic switches open when the feeder or oil switch in the substation opens, thereby affording a means to disconnect the transformers at will during light loads, and when the substation switch is reclosed, the net work switches close, with the result that the substation operator can readily maintain the system so as to eliminate light load iron losses and keep the transformers operating at maximum efficiency.

Although it is believed that in the automatic secondary network system the number of secondary junction boxes can be reduced materially or even eliminated, especially as far as fusing is concerned, it was not thought advisable in the case of the Memphis system to remove the boxes and fuses already installed, due to the fact that nearly all the old cable in use is multiple conductor of large size and a short-circuit developing in this cable might assume considerable proportions before burning itself clear. In future extensions where single conductor cable will be used consideration will be given to using fewer junction boxes.

Originally all transformers serving the underground districts, with the exception of a few installations in vaults on customers premises, were located in the unventilated cable manholes. This practice proved very detrimental, due to high temperatures, and these transformers are now being removed, overhauled and reinstalled in larger transformer manholes constructed to meet this difficulty.

Each feeder is equipped with three current transformers, potential transformers, primary relays, line drop compensators and a transfer switch mechanically operated by the oil circuit breaker. The current transformers are connected through the transfer switch to the compensators of the adjacent circuit. The current for the compensator of circuit No. 2 is obtained from feeder No. 1. If feeder No. 2 were taken out of service, the opening of the oil circuit breaker would throw the transfer switch and automatically transfer feeder No. 1 current circuit from the compensator of feeder No. 2 to that of feeder No. 3, at the same time connecting the current circuit of feeder No. 2 to its own compensator. This method provides for possible variations in the size and length of the individual feeders and permits adjusting the load on each feeder in proportion to the connected kilovolt-amperage of transformer capacity.

Electricity Replaces Oil in British Lightships

EFFORTS of the Corporation of Trinity House, which operates the lighthouse and lightship service of the British Isles, toward a greater efficiency in lighthouse and lightship surveillance are being vigorously prosecuted. Two new lightships of an improved type and marking a notable advance on those now maintained have been commissioned in the north of England. These are now approaching completion and it is expected will soon be in position. They will replace the oil-lighted vessels marking the shoals of the Sussex and Lincolnshire coasts. Two other vessels of exactly the same design and equipment have also been ordered. The provision of the vessels will place Great Britain on an equality with any other European power as regards lighthouse efficiency.

The new ships will be electrically lighted—those at present in operation are all oil-lighted—and are built of steel. Each will be fitted with a diaphone fog signal instead of the siren type hitherto in use. An entirely new and very important feature is the provision of a submarine oscillator, which will replace the old submarine bell. This will enable the navigator to determine his bearings during foggy and misty weather. The signals from the oscillator will be transmitted by means of a diaphone connected to the skin of the ship. Thus by maneuvering in such a manner as to obtain the sound equally on either side it will be possible to discover the ship's bearings. This device will enable a ship to pick up the sounds made by it within a range of 20 miles.

Safety Switches and Meter Cabinets Deter Tampering

Experience of Commonwealth Edison Company in Chicago with Externally Operated Switch Type

BY A. P. GOOD
Chief Inspector Commonwealth Edison Company

IN CHICAGO every customer's service entrance wires are required to be in conduit. In fact, the entire wiring installation in the customer's premises must be metal covered. The service switch is required to be of the inclosed safety type. This service switch is not permanently sealed, since electricity is seldom stolen by attaching wires to the main service switch, as such an attachment would be quickly apparent to any inspector, meter-reader or tester who periodically calls at a customer's premises.

However, the Commonwealth Edison Company does require that all meter connection cabinets shall be of the externally operated switch type. These cabinets contain connection blocks to which the customer's wiring is connected and the company's meter. Besides furnishing a link between the company's meter and the customer's wiring, these connection blocks facilitate the testing of meters with the minimum amount of inconvenience to the customer, and through such meter connection cabinets theft of current is materially lessened.

With the exception of the cabinets rated at 60 amp. and larger all have a service fuse of 30 amp. The circuit fuses are either in a separate cabinet independent of the meter connection cabinet or are a part of the meter connection cabinet but are accessible to the customer so that the customer has no occasion to open the sealed meter connection cabinet except in the event of the service fuse operating.

Circuit fuses in Chicago are required to be no larger on lighting circuits than 15 amp. Therefore the customer should have no occasion to open the meter connection cabinet unless he either has installed a circuit fuse of too large capacity or has bridged the fuse receptacle so that as a result the service fuse inside the meter connection cabinet operates.

PRACTICE IN SEALING

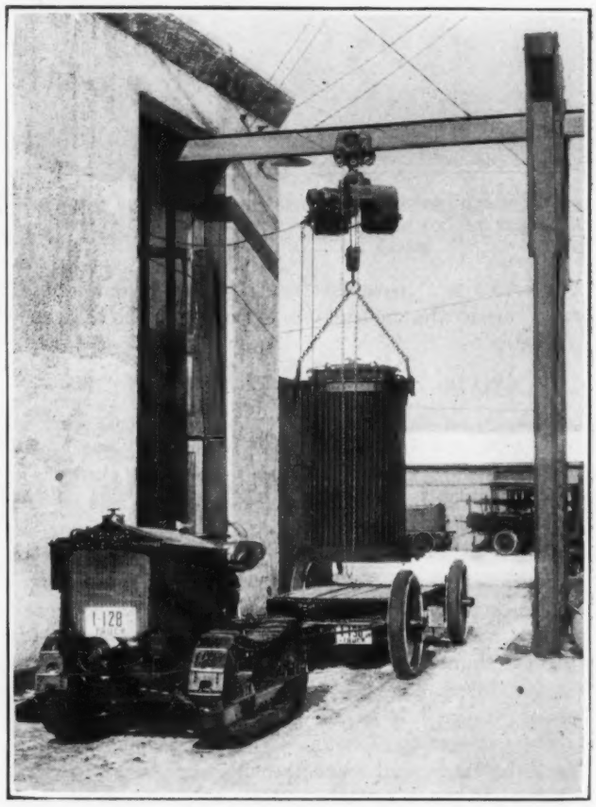
The department of the company that installs the meter seals every meter connection cabinet. The meter inspectors of the company, who make the call and check the meter connections soon after the meter is installed, are finding a very small percentage of meter cabinets unsealed. Investigation on 10,000 installations has shown that after meter connection cabinets are sealed, representatives of the company calling later found about 30 per cent had the seals removed by customers in order, presumably, to renew service fuses. Upon inspection of the 30 per cent of the installations on which seals were found to be broken, it was found that the renewed fuses were as follows: 77.6 per cent had 30-amp. fuses, 5.4 per cent had 20-amp. fuses, 13 per cent had 15-amp. fuses and 4 per cent had 10-amp. fuses, which indicates that the greater portion of the service fuses renewed by customers are the proper capacity.

There seems to be no question that the sealing of the meter connection cabinets acts as a deterrent to customers toward the renewing or tampering with service fuses. Since the 15-amp. circuit fuse has been permitted it is rather surprising to find on how few installations the fuse receptacle has been tampered with or bridged by means of wire, tinfoil or pennies.

No attempt has been made by the company to use tags or other forms of instructions to warn the customers against the breaking of seals or the renewing of service fuses under seal. No attempt has been made to seal the 15-amp. fuses.

Since March 1, 1920, the Department of Gas and Electricity of Chicago has required the use of inclosed safety type service entrance switches. Since this date there have been installed in Chicago something like 80,000 of these switches. This estimate is at best a rather rough one, as it is difficult to obtain close figures, and does not include the number of meter connection cabinets used in place of service entrance switches and so permitted by the Department of Gas and Electricity of Chicago on apartment installations of three meters or less. Since Oct. 1, 1922, the date on which meter connection cabinets were required in Chicago, there have been installed something like 350,000 such cabinets.

Flexible Equipment-Handling Facilities



PROVISIONS for handling equipment are frequently thought of as entailing considerable investment that may remain idle for long periods. The illustrated combination of a monorail crane, electric hoist, tractor and trailer affords a very flexible arrangement employed by the Vermont Hydro-Electric Corporation in service and construction work. The monorail and electric hoist constitute permanent equipment of the service station at Rutland. The tractor and trailer, being floating equipment, can be used on a variety of jobs.

Letters from Our Readers

A Good Word for the Covered Wagon

To the Editor of the ELECTRICAL WORLD:

Municipalities *are* like individuals; they have different temperaments and different abilities as well. We may even, without criticism, class them as the covered wagon of power history where the modern high-tension line is the express train. But do you not think that your editorial of Sept. 18 is rather an overdose of central-station propaganda?

Granting that the modern power system is the logical one to consider first when contemplating power supply, and that because of its interconnections such a system warrants special consideration, there are still dozens of municipal plants scattered through the country that are rendering equally good, if not better, service at a lower cost. I can name close to a hundred places with which I am personally familiar where talk of abandoning the municipal station would cause one to be laughed out of town. Two plants in particular stand out in my mind as I have visited them both in the last three months and consequently am well posted on their operation.

Seattle, Wash., with a combined steam and hydro-electric system, furnishes domestic service at 5½ cents for the first 40 kw.-hr. and 2 cents for the next 200. Anderson, Ind., with a steam station, sells domestic energy for about 7 cents, as compared with neighboring cities supplied at 9 cents to 12 cents by the lines of a Middle Western "combine." A little more than a year ago I was in Carthage, Mo. It has a Diesel plant, and as I remember was charging 8 cents for the first 25 kw.-hr. and 6½ or 7 cents for the next 50 or 75. Power rates for larger quantities were proportionately low, but I cannot recall the exact amounts offhand.

Then there is the little community of Elmhurst, just outside of Chicago, with a population of about 5,000. Several years ago it installed an oil-engine plant rather than pay 2½ cents for power. The load grew, the power company held out for 2½ cents, and as power was costing the city only about 1 cent with the oil engines, it ordered another unit of 300 hp. The engine was on the siding ready to unload when the vice-president of the power company considered the matter serious, with the result that the city will be getting power for less than a cent. The engine order was canceled and the engine taken off the hands of the city without one cent of expense to it, the contract for power having an emergency clause in it to justify such a rate before the public utility commission. The old engine plant still stands ready for service, making, one might say, 1½ cents on each kilowatt-hour the city uses, although it has not turned over in months.

This is certainly a shining example of the rate-cutting practice which you so strongly condemned in a recent editorial. I am not a federal, state or municipal ownership advocate and am financially interested in several of the so-called "power combines." No one can estimate the value of these companies to the industrial, rural and semi-rural communities of our country where their network of high-tension lines means a dependable supply of power for the mere expense of a transformer station. Still, they find it impossible to make any headway in their fight to control dozens of well-managed Middle Western Diesel-engine plants without making an excessive rate cut for the purpose of making a showing. If they cannot do it in their stronghold—the Middle West—where can we expect them to do it?

Recently a list of municipal stations abandoned in favor of central-station power was published. On paper it looks quite impressive. I happen to know many of the plants and cities mentioned, and the list loses its impressiveness when I look it over closely—little fish that a real fisherman would feel duty-bound to throw back, stations that were abandoned before the company's "high line" came along, little places that cannot support a weekly paper but which when properly press-agented and photographed look like a million dollars.

Usually municipal ownership is to be discouraged, but why not give credit to those that are beating the power companies at their own game in spite of the disadvantage of politics? If the covered wagon goes over the mountain in several hours' less time than the express train goes around it, you will find the modern business man riding in the covered wagon. Why is a municipality foolish seriously to consider, at least, the same transportation if it will be to its advantage? Certainly enough of them, from villages to cities, are doing it to prove that it can be done. J. J. ALDEN.

Chicago, Ill.

Mr. Kasson Replies to Mr. Benesovitz

To the Editor of the ELECTRICAL WORLD:

The writer of the interesting criticism printed in your issue of Oct. 16 on my article entitled "Conjectures and Speculations" has overlooked the fact that all unknown space may contain air at varying attenuations and that all so-called vacuums artificially produced do contain air at some degree of attenuation. There is no known perfect vacuum, nor is there a valid reason for believing that the atmosphere stops at a certain point in space. Rather, it is more logical to assume a varying gaseous attenuation from the earth's surface outward toward limits impossible of conception.

The analogy of earth resistance and air resistance is illogical from the standpoint of numerical value, but not from the standpoint of relative stress gradients from a given source of electric power. The resistance of the whole medium is of importance; in fact, it is the relatively low-resistance part of the circuit. The principal resistance in the case of either air or earth is the immediate-contact resistance at the point of stress, just as the critic has stated. In the case of the theoretical point the resistance is infinite, but the point referred to in my text possessed some dimensions. Possibly it would have been more appropriate to describe it as a small body.

From such a small body in contact with the atmosphere it is possible to dissipate electric power of known measured current and watt value at a given stress. This dissipation takes place at all stress values, but at the so-called corona or air-breakdown point power is more readily dissipated into the atmosphere. This is due to the increasing conducting geaseous envelope surrounding the small body and the gradual extension of the limits of this envelope as the stress increases, with consequent greater contact with the atmosphere in general. C. L. KASSON.

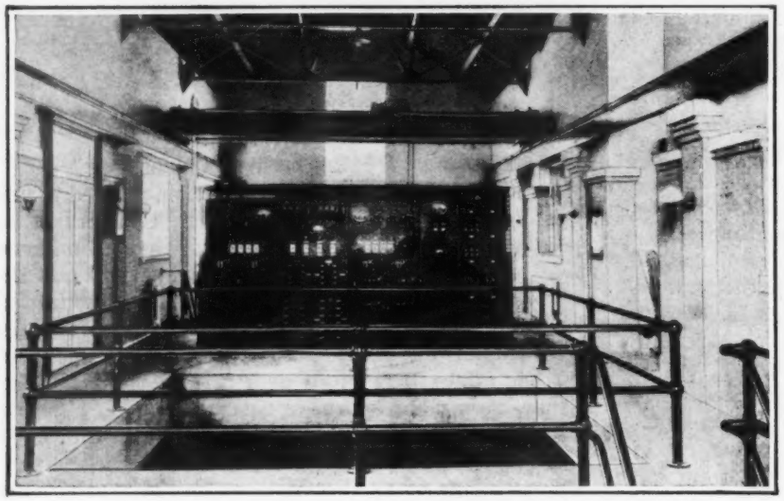
Edison Electric Illuminating Company of Boston.

Central Station and Industrial Practice

Electrical Equipment for Sewage Disposal Plant

A NEW sewage disposal plant just completed for the city of New Rochelle, N. Y., is capable of handling a maximum of 20,000,000 gal. of sewage per day, although the plant is a comparatively small one. The plant is electrically operated and involves an interesting arrangement of motors and control.

In the case of a flood or very severe sewage conditions, the sewage can be bypassed directly into the bay. The sewage enters the plant through a hydraulically operated valve, near which is a bar gate that picks out the very large pieces of waste matter. The sewage then passes through either or both of two hand-operated gates into cylindrical screens, which take out a large percentage of sewage matter and allow the water to flow into a large sump. The sewage is elevated to a compressed air ejector, which blows it into another building, whence it is hauled away to be used as fertilizer. The water in the sump is treated with a chlorine solution and then pumped into the bay.



INTERIOR VIEW OF PLANT, GIVING LOCATION AND LAYOUT OF THE CONTROL AND SWITCHBOARD PANEL

There are two centrifugal pumps, each driven by a 40-hp. slip-ring motor. The arrangement is such that either motor may be operated manually or automatically, separately or simultaneously. The panel controlling the operation is automatically energized by means of five float switches, each one set at different water levels. When it is desired to operate automatically, either or both of the switches controlling the two motors are thrown to the "automatic" position.

The sequence of automatic operation is as follows: When the first float switch closes, the motors automatically accelerate to 80 per cent of full-load speed and the water will be pumped at the minimum rate from the sump into the discharge line to the bay. Should the water in the sump rise faster than it is being pumped out, the second float switch will operate, bringing the pump motors to 85 per cent of full-load speed. This continues as the water rises, each of the remaining float switches being actuated at its corresponding water level, increasing the pump motor speeds to 90 per cent, 95 per cent and 100 per cent of full load. The operation is reversed as the water level falls, the motors automatically slowing down as the water reaches each float switch level.

At each speed of the motors a bull's-eye lamp is lit, indicating to the operator the speed at which the motor is running. When operating by hand, the control is first thrown to the manual position, and as soon as the "start" tumbler switch is closed the panel automatically brings the motors to the 80 per cent speed. The other speeds are obtained by throwing tumbler switches mounted on the board.

By adopting this method of speed control the engineers found it possible to use a smaller motor and a smaller discharge pipe than would be required if the pumps were operating at the 100 per cent speed only.

Baking Insulated Coils in the Electric Oven

THE application of electricity to the baking of insulated coils was first developed in street railway shops, superseding steam and gas for baking armatures after they had been impregnated with an insulating compound. The results obtained have been so satisfactory that the use of electricity for the baking of coils has extended into industrial plants for general repairs to electrical machinery and miscellaneous coils, and into the electrical manufacturing industry for baking all sorts of coils and electrical parts.

The type of oven used is called an armature-baking oven, because its great value in making savings and promoting reliability was demonstrated first on railway motor armatures. It has since been found that it is of equally great value in baking industrial motors, and any type of core used in electrical apparatus for that matter. According to the power committee of the N.E.L.A., it is not uncommon to find an increase of 75 per cent in the life of motors that have been dipped and baked in an electric oven. Besides this direct saving there is a great gain due to the freedom from failures and breakdowns while in service.

The reason for the longer life and improved reliability of electrical windings and coils that have been heat-treated is that the insulating varnish, properly applied and baked, forms a hard coating, impervious to moisture, which fills all cracks and crevices, holds loose coils and laminations in place, restores damaged coil insulation to good condition and prevents the entrance of dirt and moisture.

Electric heat for baking electrical apparatus not only has the ordinarily understood desirable char-

acteristics but is without the disadvantages of other forms of heating, such as maintaining a steam plant throughout the summer months or winter nights; also fuel storage or handling machinery is not required. Likewise it heats the same, summer or winter, without overheating or underbaking of the material. There are no products of combustion in the oven, hence it is kept clean. Moreover, there is no danger of damage to the work due to leaky steam coils. The oven can be located in the part of the shop most convenient to the work without any regard to steam or gas lines, and the use of a heat source without a flame greatly reduces the normal fire hazard.

Laying 200 to 400 Ft. of Fiber Duct per Hour

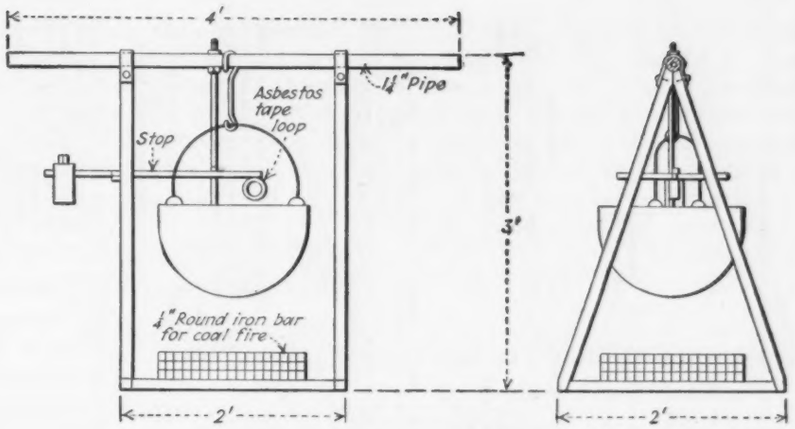
BY F. N. ANDERSEN
Superintendent of Construction Eastern Division, Consumers Power Company

IN CONNECTION with the construction of the Saginaw River steam plant of the Consumers Power Company it was necessary to lay 23 miles of underground fiber duct line. By employing the usual method of laying fiber duct it would have been impossible to keep pace with the rest of the construction work, and consequently some innovations were developed that greatly expedited the work, permitting three men to lay 200 to 400 lineal feet of 2 to 4-in. duct per hour.

In studying the usual method of laying fiber duct it was found that the greatest delay is caused by the usual method of coating the ends of the fiber duct. To eliminate this delay a compound kettle support and dipping device was developed and the laying of the duct organized along lines different from those customarily followed.

The kettle support and dipping device, which is illustrated herewith, consists of a pipe framework from which the compound kettle is suspended and on which is a grate for a coal fire. Attached to the framework is also a counterbalance arm pivoted so that an asbestos loop attached to one end can be dipped into the kettle to pick up compound and be restored to a position where the fiber duct can be inserted inside the loop and rotated for applying the compound to the end.

Another accessory to the revised method of laying fiber conduit consisted of concrete spacers 1 in. square and 16 in. long reinforced with a single No. 9 wire. These spacers were used to maintain horizontal and vertical spacing of the duct runs.



KETTLE SUPPORT AND DIPPING DEVICE

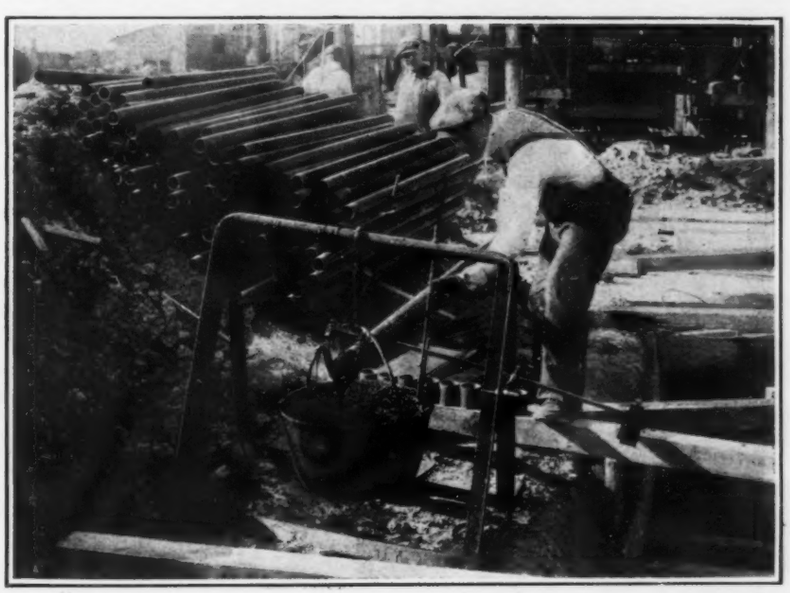
The kettle for heating the compound was placed at the side of the trench about 30 ft. in advance of the point from which the duct line was to start and was moved along as the work progressed.

A crew of three men was required. One man supplied the material to the worker at the kettle, kept up the fire and from stock and piles near by provided concrete spacers to a man in the trench. The second man picked up a section of duct from the pile at his left and used it to tilt the counterbalance arm into the compound and thus immerse the asbestos tape loop in the compound. The counterweight returned the loop to a position where the end of the duct could be placed inside the loop and rotated to apply a coating of hot compound. As soon as this operation was completed the compounded duct end was inserted into a coupling, a supply of which was kept between the worker and the kettle. The prepared duct was then laid on the ground to the right with the coupling toward the end of the trench from which progress started, and the operation was repeated.

In the meantime the third man, in the trench, was preparing for the next section of duct to be laid. When this had been done, the man at the fire took a section of fiber from the pile at the right, applied the compound to the end and tossed it endwise to the man in the trench, who caught and placed it.

Pipe joint compound prepared by the Barber Asphalt Company was found to be superior to pitch, tar or asphalt, as it is less volatile and does not become brittle when cold.

A coal fire was employed because it was considered superior to other fires in that it maintains a more even



MEN LAYING FIBER DUCT WITH KETTLE SUPPORT AND DIPPING DEVICE AT ONE SIDE

Partial Log of Tests on Conduits Under Short-Circuit Conditions

Some Specific Results of Tests Showing Resistance of Conduit Materials to Electric Arcs—Fiber, Surrounded by Concrete, Stone Pipe With and Without Concrete, and Monolithic Conduit Tested

Furnished by W. G. Kelley, assistant engineer of distribution, and T. G. Le Clair, assistant engineer of inside plant, Commonwealth Edison Company

Test No.	Ducts	Separation	Cable and Position	Short Circuit	Average Current, Amp.	Time, Seconds	Arc Energy, Kw.-Seconds	Results of Tests: Test Cable	Results of Tests: Test Duct	Results of Tests: Adjacent Duct	Remarks
4	3½-in. limestone and cement, also 3½-in. quartz sand and cement	1-in. precast concrete spacer imbedded in loose sand	500,000 c.m. 3/C, lead covered in both upper ducts	12,000 volts from copper to lead in two ducts. At duct joint in both cases. Short circuits on different phases; closed and opened simultaneously	4,350	0.61	.....	2-in. diameter hole in sheath of both cables	Limestone did not crack or fuse, except slight crack at joint in duct. Iron band fused. Sand duct cracked full length and fused on inner surface.	Not damaged	Inner surface of sand duct much rougher than limestone duct due to glass bubbles
6	3½-in. quartz sand and cement	In contact in concrete	500,000 3/C, in lower left duct	Three-phase 2 in. from duct joint	5,600	2.13	.....	Burned completely in two. Lead burned away 1 ft. each side of fault	Section about 18 in. long facing air space in center of structure was badly cracked and crumbled. Inner surface fused and eroded. Ring band partly fused	Badly cracked for about 7 in. and partly fused. Ring fused at one end. Lead burned off dead cable inside	This was the first test that showed enough communication to cause a short circuit in the witness cable, had it been alive
7	3½-in. limestone and cement	In contact in concrete	500,000 3/C, in lower left duct	Three-phase at duct joint	6,000	1.50	.....	Lead burned away 6 in. each side of failure. Conductors spread	Shattered for about 12 in. facing center of structure. Plug blew out east duct. Ring burned through	Outer surface sprayed with metal. Not fused nor cracked	Soot on witness cable caused by smoke filling air space between ducts and blowing in under ring to witness cable
8	3½-in. quartz sand and cement	1-in. concrete fill between ducts	500,000 3/C, in lower left duct	Three-phase at duct joint	6,000	1.38	.....	Burned completely in two. Lead burned away 6 in. in both directions	Inner surface badly fused and coated with sharp glass. Not broken	Not damaged	Surface rough enough to injure cable pulled in to replace one which failed
9	3½-in. Orangeburg fiber tubing	2-in. concrete fill between ducts	500,000 3/C, in lower left duct	Three-phase at duct joint	6,000	1.41	.....	Lead burned away 1 ft. in each direction. Not burned completely in two	Completely destroyed for about 8 in. on one side of duct. Also cracked longitudinally in several places. Wall surface was still quite smooth, with no sharp projections	Not damaged	A crack was noted in the duct protection that was evidently due to poor adhesion between the first and second pourings of concrete. It extended from the duct containing the short circuit underneath the adjacent duct to the surface
13	Murray system 6-4 in. ducts, quartz sand	2-in.	500,000 3/C, top left duct	Three-phase at center of duct	5,100	3.07	15,200	Burned in two. 3 in. of copper burned out	Eroded about ½ in. on entire circumference for about 1 ft. Surface coated with hard glass. Very rough surface	Not damaged	More flame and smoke than on previous tests
14	4-in. monolithic tamped Elecrete quartz sand	½-in.	500,000 3/C, in top left duct	Three-phase at center, of duct	5,100	4.73	21,800	4 in. of cable copper burned out. Lead burned away for a considerable distance back of short circuit, also at end of duct and end of expansion chamber	Eroded ½ in. for about 1 ft. Surface glazed in spots. Glass bubbles fairly easily removed	Not damaged	In this and succeeding tests one end of the duct containing short circuit was plugged with concrete. The other end was covered by an expansion chamber consisting of a 6-in. iron pipe 5 ft. long and capped at the outer end, except for a hole large enough to admit the cable
16	4-in. monolithic poured limestone and cement	½-in.	500,000 3/C, in top left duct	Three-phase at center of duct	5,200	4.7	23,500	3½ in. of cable copper burned out. Lead burned away as above	Eroded about ½ in. Surface coated with hot particles of copper which are very tough. Not firmly attached to concrete.	Not damaged	.....

temperature and is less likely to set fire to the compound, which must be heated to a temperature that produces a watery consistency. A small hand fire extinguisher was kept within easy reach to quench fires that occasionally occurred in the kettle. To prevent his coming in contact with the hot ends of the duct, the man in the trench was not allowed to work with his arms or hands bare.

Effect of Cable Short Circuit on Conduit

WITH a view toward determining the kind of conduit construction that is least vulnerable to cable short circuits, the Commonwealth Edison Company has conducted extensive tests, which were discussed in the Sept. 25, 1926, issue of ELECTRICAL WORLD (page 629) by W. G. Kelley, assistant engineer of distribution, and T. G. Le Clair, assistant engineer of inside plant. Fiber surrounded by concrete, stone pipe with and without concrete protection, and monolithic concrete duct were tested. The conditions of test and photographs during and after tests were presented in the issue mentioned.

On the opposite page is a partial log of the tests showing specific conditions and results obtained. Close examination of the concrete ducts having enough backing to prevent splitting under the high pressure of a cable short circuit showed that the only material damage to the ducts seemed to be erosion due to vaporization of the concrete. The maximum amount in any case was about ¾ in.

Synchronous Motor Substituted in Large Paper Mill

THE new equipment at the Canadian International Paper Company's mill at Three Rivers, Que., involves many advances in the paper-making art. This mill recently increased its capacity by doubling the number of its paper machines and making corresponding increases in other equipment.

An example of modern practice is the use of synchronous motors where induction motors have heretofore always been used. The illustration herewith shows the new type high-capacity Bird screens for screening ground wood pulp and driven by direct-connected, 75-hp., 360-r.p.m. synchronous motors. The screen shaft has ball bearings on each side of the motor rotor and the screen is overhung.

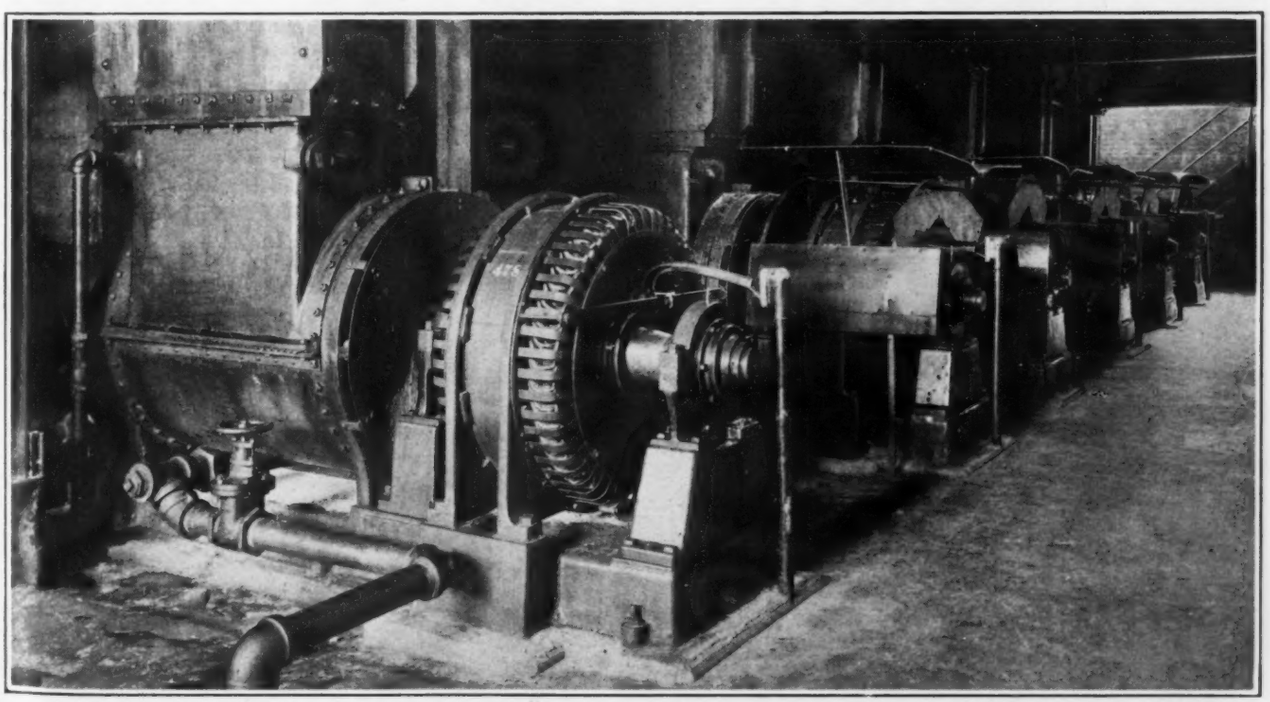
Machines of the type mentioned have always previously been driven by belt-connected induction motors. The power factor is improved by the new method, and belts, pulleys and bearings are eliminated by the change made.

The vacuum pumps are driven by overhung, 104-hp., 220-r.p.m. synchronous motors. These essentially slow-speed vacuum pumps have heretofore been driven by belt-connected induction motors, and by changing to the synchronous motor drive the advantages of improved power factor and elimination of bearings, pulleys and belts are secured.

Cost of 10,000-Kva. Condenser Installation

FOR power-factor correction the New England Power Company recently installed a 10,000-kva. synchronous condenser at its Fitchburg (Mass.) substation, at an estimated cost of $72,520, of which $69,664 had been expended to July 31 last and the balance was the expected cost of completing the work. The itemized elements in this total are given in the table above.

Building additions	$4,860
10,000-kva. condenser installed	42,161
Starting equipment	3,240
Switchboard	2,700
Control conduit and cable	2,700
Outdoor 13,200-volt equipment	4,320
Lighting	324
Painting, fencing and screening	324
66,000-volt additions	2,160
Sub-total	$62,789
Contractor, 10 per cent	6,278
Sub-total	$69,067
Engineering, 5 per cent	3,453
Total	$72,520



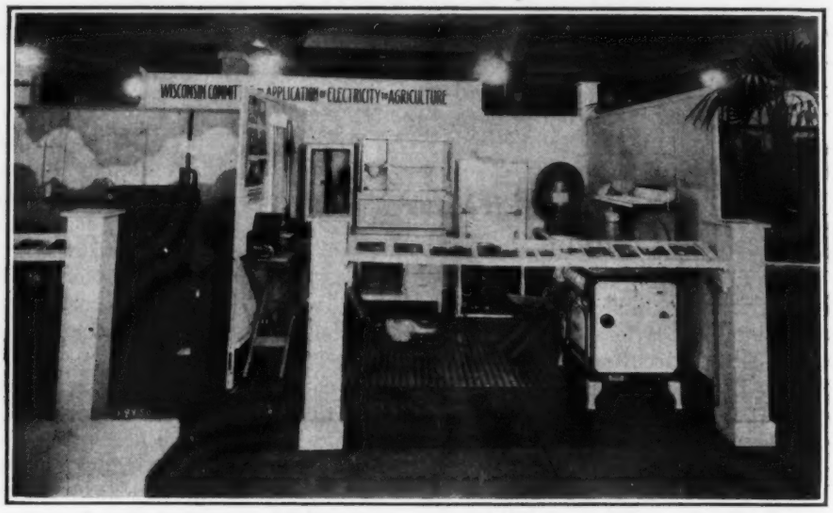
Courtesy of General Electric Company.

SIX 75-HP., 360-R.P.M., 550-VOLT SYNCHRONOUS MOTORS DRIVING SCREENS IN GROUND-WOOD SCREEN ROOM. THE SCREEN SHAFT HAS BALL BEARINGS EACH SIDE OF MOTOR WITH SCREEN OVERHUNG

Commercial Activities and Public Relations

Rural Service Exhibit Without Utility Expense

FOR the first time, in Wisconsin at least, an exhibit of typical rural applications of electric service has been made at a state fair without any expense to the utlity companies or manufacturers of the products displayed. The exhibit was made at the Wisconsin State Fair in Milwaukee during the week of Sept. 4 by the Wisconsin Committee on Relation of Electricity to Agriculture. Space was obtained in the educational building at the request of Dean Jones of the agricultural department, University of Wisconsin. Heretofore similar exhibits have had to be made in the manufacturing buildings and the space paid for.



DISPLAY OF SOME FARM-KITCHEN ELECTRICAL APPLICATIONS AT WISCONSIN FAIR

The exhibit consisted of three parts: a model farm kitchen, a farm yard and a model dairy. A unique feature of the display was a visible demonstration to prove the folly of manual labor competing with electro-mechanical power. Farmers were invited to test their ability in competing with a ½-hp. motor-driven pump, the contestant pumping into the same size receiver as that to which the motor-driven pump discharged. A few contestants were able to keep up with the pump for one minute, after which they lagged increasingly and finally withdrew.

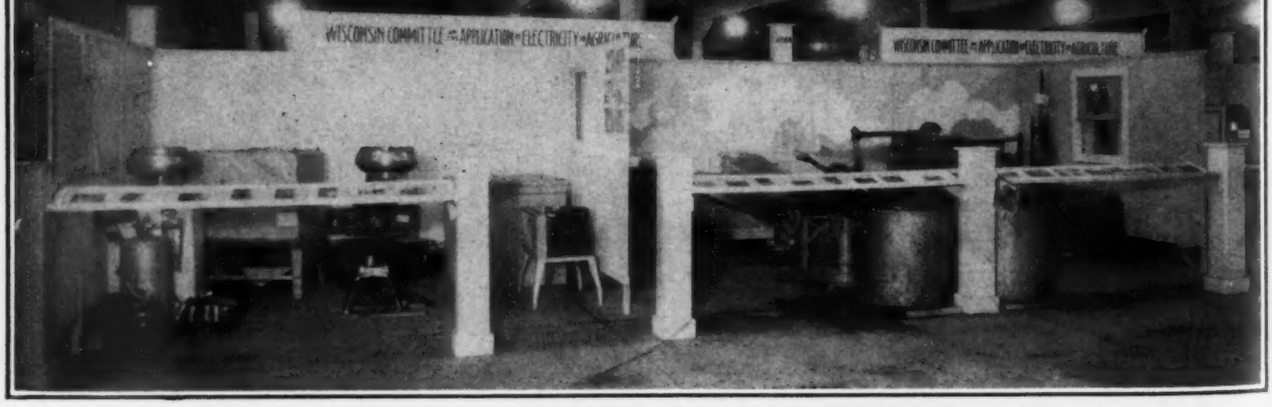
Various applications were displayed such as a utility motor with flexible-shaft drive, feed grinder, cream separator, milk tester, can sterilizer, electric refrigerator and household equipment. Pictures of applications on the Ripon experimental farm line were also displayed.

Compared with other exhibits at this fair the rural service exhibit attracted an unusually large crowd of visitors, but the number was not recorded.

Build Borrowing Power to Avoid Speculator's Prices

MANY holding companies or even operating companies that have expanded their systems in the last few years have bitterly complained against the speculators who have secured strategically located properties and tried to "hold up" the electric-service system in which the property logically belongs. Prices have been asked that could never be justified on an appraisal and legal earning basis. Some of the companies have suggested that the speculator could be practically eliminated if the old-line companies would desist bidding against one another or would collectively refuse to pay the exorbitant prices asked. This is logical advice, but it is based on the Utopian premise that companies will quit bidding against one another and that there may be some means of securing the properties desired at lower prices than that at which the speculators wish to sell.

A much more practical method of securing properties without paying fancy prices is being followed by a company noted for its conservative purchasing. It is based entirely on



A FEW MODEL DAIRY AND FARMYARD ELECTRICAL APPLICATIONS SUGGESTED AT STATE FAIR

conditions within the control of the purchaser—namely, credit standing or borrowing power. The company referred to builds up its borrowing power as much as it can, for example, by decreasing its bonded indebtedness and increasing its junior securities. Then, when the money rate is higher, when the speculators are more pressed for funds to hold properties, when most companies cannot secure money so easily for new acquisitions, this company with its excellent credit standing can borrow money readily and purchase properties at a lower price.

According to the executive who is following the foregoing practice, at least those companies that will build up their borrowing power can protect themselves against speculators to a certain extent.

Rates for Street Lights Reduced in Alabama

THE Alabama Public Service Commission recently issued an order approving a new schedule of contract rates for municipal street lighting to be effective under contracts entered into subsequently to Oct. 1, 1926. The new rates will be a material reduction in the rates for this class of service and will affect all of the towns served by the Alabama Power Company under the terms of the company's standard five-year municipal contract. These rates will not be effective under existing contracts, but the company will extend the privilege of canceling present contracts to any city or town desiring to avail itself of the reduced rates by the execution of a new contract. Both the new and the old rates are given in the accompanying table.

REDUCED STREET-LIGHTING RATES OF THE ALABAMA POWER COMPANY

Lumens	Candlepower	Rates per Lamp per Year New	Old
600	60	——	$22.50
800	80	$23.60	$25.00
1,000	100	$26.00	$27.50
2,500	250	$39.00	$50.00
4,000	400	$55.00	$75.00
6,000	600	$75.00	——
10,000	1,000	$100.00	——

The 6,000-lumen and the 10,000-lumen lamps have been added to the new schedule. The rate reduction of the present 4,000-lumen or 400-cp. lamps is approximately 27 per cent, whereas on the 2,500-lumen or 250-cp. lamps the reduction is about 22 per cent. The company feels that the rates for the larger-sized lamps are very attractive and hopes that the various towns and cities will avail themselves of more extensive use of these sizes.

The commission also approved a modification in the rate classification covering white way and display lighting. The change made reads as follows: "Where the customer desires the company to operate all or any part of installation on a 'dusk to dawn' all-night schedule, an addition to the rates of 0.5 cent per watt per month will be charged for all lamps operated on such schedule."

Campaign in Memphis Nets 43,000 Lamps

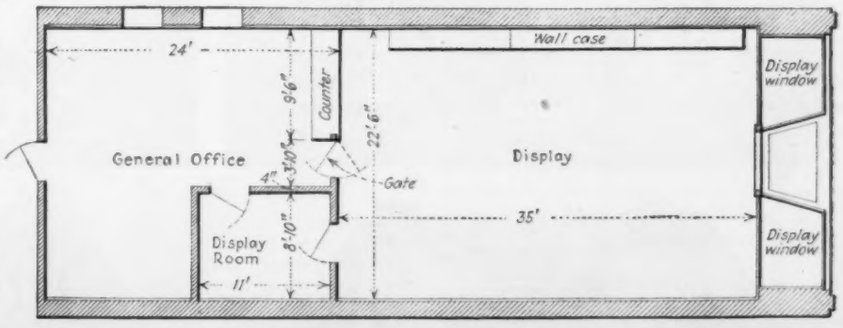
AS A RESULT of a concerted campaign by the employees of the Memphis Power & Light Company during the month of August approximately 43,000 60-watt Edision Mazda lamps of the new type were sold. A quota of 40,000 lamps had been set for the sampaign. Prior to launching the campaign, a carefully prepared plan was worked out and the department heads were instructed to ask their respective employees to enter into it heartily. Meetings were held with J. J. Brennan, commercial manager, explaining details as to how the campaign should be conducted.

Commissions were offered on sales as an incentive and were liberal enough to arouse interest throughout the personnel of the company. Meetings were held during the month to urge employees to continue activities, and then as an additional incentive four prizes—two for the women and two for the men —were offered for the employees turning in the biggest number of sales.

This campaign was so successful that a second one may be conducted before the end of the year.

Uniform Local Offices for Large Utility

THE Carolina Power & Light Company of Raleigh, N. C., has adopted a uniform layout for the local offices in the various towns it serves throughout its properties. A typical arrangement is shown in the accompanying illustrations. Of course the size of these several offices varies with the size of the towns served, but the same general plan is followed throughout. In all, the company has 30 of these offices—23 division offices, each one of which is under a local manager, and seven smaller subsidiary offices.



District Window Displays Made Uniform

THE method described below for handling display windows of local commercial offices of a utility that has a comparatively large number of such offices has been found to be very effective. At least this has been the experience of the Carolina Power & Light Company of Raleigh, among other companies that have tried it. Besides being economical as an advertising medium, uniform and high-grade displays are assured. Briefly, the plan is to work up a window display in the Raleigh office, have this photographed and send this photograph, materials required and instructions for setting up to each of the local offices.

In a room suitable for photographing purposes, the advertising manager of the company tries out various arrangements to obtain the most suitable and economical displays. Subject matter is varied constantly to take in the whole range of appliances sold. Also, displays appropriate to holidays and national events are worked up.

The actual set-up is then photographed as shown in the accompanying illustrations and suitable instructions are written. These are mailed to the thirty local offices of the company with the necessary decorations. In some cases the decorations are furnished locally, but usually most of the materials required are hard to purchase in the smaller towns, hence in order to keep the displays uniform the materials are sent from Raleigh.

A new display is sent out each week and where two show windows are available is used for a period of two weeks. Where the office has only one window, the displays are changed weekly. Local salesmen are used to install the displays. All local office windows are not of the same size, but it has been found that the displays can be readily adapted to various space sizes.

Sample Instructions for Setting Up Display Window

The Peasant and the King

"PUBLIC utility service places conveniences in the home that kings in their castles could not command." This is a fact, and in this trim we have attempted to put this message over in a way so as to stop the passers-by and make them read.

This trim should replace the Kelvinator display in all two-window towns and should be installed immediately.

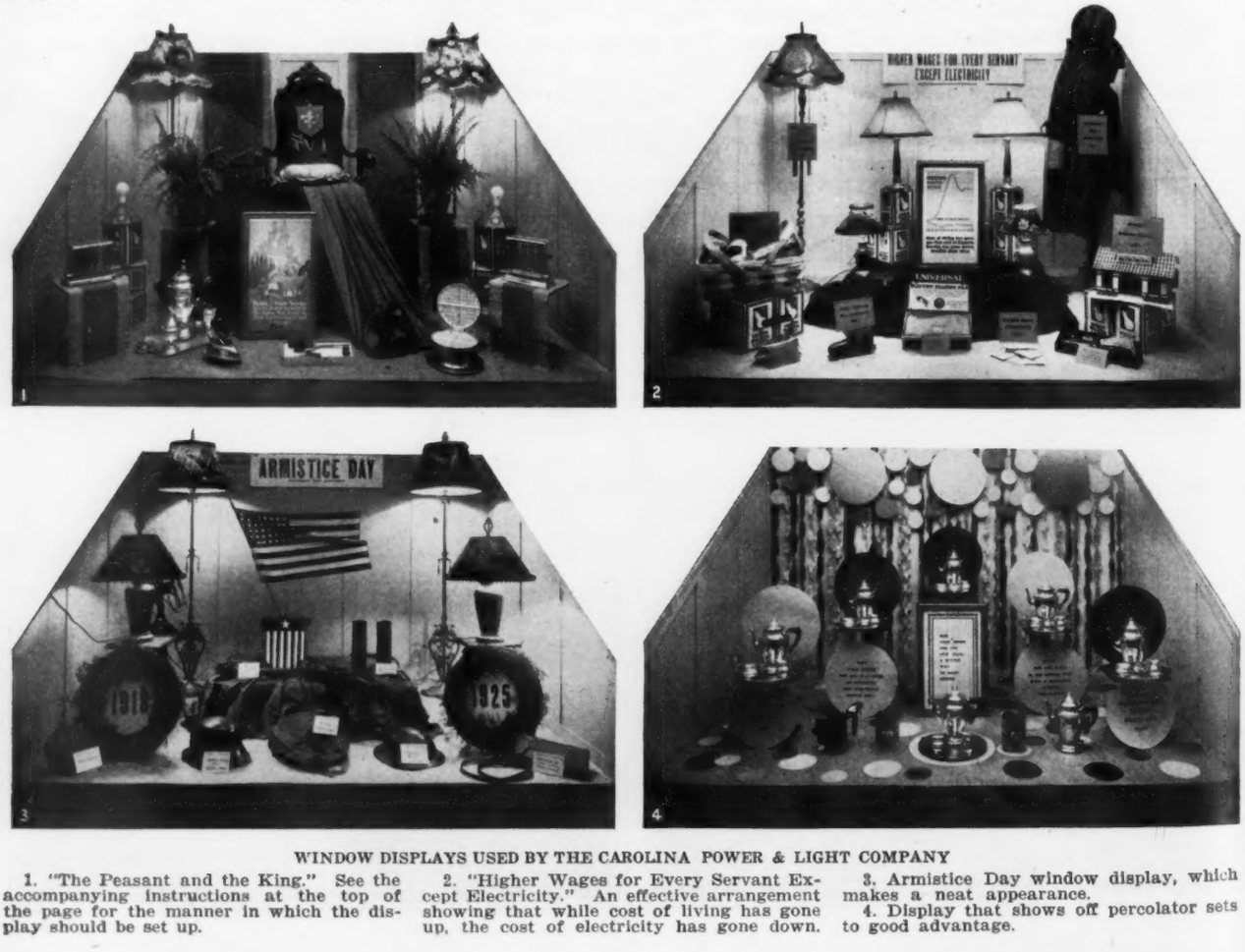
First, place a plateau about 12 in. high in rear center of window and drape with black sateen. A chair, one with high back and upholstered if possible, is next placed on plateau. Purple sateen is pinned to cushion and draped to floor as shown in photograph. A cushion is next placed in chair on which the crown is placed. A purple shield with gold design is next attached to back of chair. Patterns for crown, shield and emblem are included in material furnished.

The crown is made by cutting out of cardboard and covering with gold paper. The shield is done in the same manner, but purple crêpe paper is used instead. The emblem is next cut out of gold paper and stuck on shield.

On each side of chair a full width strip of purple crêpe paper is tacked to back, running from ceiling to floor. A 2-in. strip of gold crêpe is used to edge purple crêpe. See photograph.

To right and left of throne chair is placed an 18-in. pedestal with fern. A strip of purple crêpe cut same width on top of pedestal covers pedestal and extends to floor. Gold crêpe is also used to edge purple crêpe on pedestals. The 12-in. pedestals on which appliances are placed are treated in the same manner.

Two floor lamps and a stock of Mazda lamp cartons complete the display. If you have a spot light, throw light on crown. If window is equipped with colored screens, use purple reflectors. When flasher is removed from Mazda lamp window, the old poster should be mounted on cardboard and placed on easel. This will keep the Mazda trim intact.



WINDOW DISPLAYS USED BY THE CAROLINA POWER & LIGHT COMPANY

1. "The Peasant and the King." See the accompanying instructions at the top of the page for the manner in which the display should be set up.

2. "Higher Wages for Every Servant Except Electricity." An effective arrangement showing that while cost of living has gone up, the cost of electricity has gone down.

3. Armistice Day window display, which makes a neat appearance.

4. Display that shows off percolator sets to good advantage.

Digest of Electrical Literature

Generation, Control, Switching and Protection

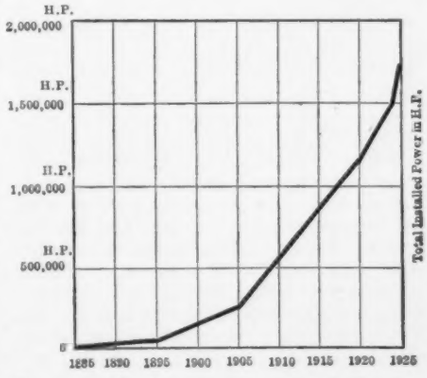
Time, Voltage and Current Characteristics of Lightning Arresters.—K. B. McEACHRON.—Time is of vital concern in the protection of electrical apparatus against the effects of so-called lightning disturbances. In power circuits where sixtieths of a second are a common measure a thousandth of a second can be regarded as a small unit. The safety of thousands of dollars' worth of apparatus and the assurance of uninterrupted service may depend upon what takes place in so short an interval. In the first part of his paper the author discusses the mechanics of lightning discharge, the influence of electrostatic fields, the action during lightning discharge, with value of flash-over voltage and discharge current, and describes the operation of different types of arresters. The protective characteristics of a complete lightning arrester are included in this article, showing clearly the volt-time, ampere-time and volt-ampere curves. The two phases of operation of the arrester are given, showing the relation of the breakdown voltage in the gap and the voltage drop following the gap breakdown. Arresters differ greatly in these important time relations, according to the author, and different types of arresters with the same voltage measured across them with a sphere gap may readily give altogether different degrees of protection. The results show that the pellet oxide-film arrester has a low voltage breakdown with a still lower resistance drop and the ability to discharge large current readily. The proper design of a barrel-type arrester requires that an arrester of this type should allow a low resistance path to ground and yet as the current of the impulse decreases maintain sufficient voltage across the arrester to insure that appreciable system current does not follow the impulse. Previously it has not been possible to determine the protective characteristics of arresters in detail, but with the cathode-ray oscillograph means are now available for determining the protective quality of arresters while functioning on steep-wave-front impulses.—*General Electric Review*, October, 1926.

Illumination

Spectro-Energy Analysis of High-Intensity Arc and Beam.—FRANK BENFORD.—This is one of a group of papers presented as the result of studies in the projection of light. A complete spectrum analysis of the searchlight must not only give the composition of light from each component section of the arc, but, according to the author, it must answer three additional questions: (1) Where does the light come from? (2) Where does the light go to? (3) What happens to it on the way? The methods outlined in the article are considered to give a reliable analysis of the beam, although not entirely free from systematic errors, and in addition to give detailed information about the individual parts of the searchlight. The arc is analyzed for crater light and light from a point above the crater, the mirror and door are separately tested, and finally the entire beam is tested at short range and the composition of the crater light after filtering by the mirror and door is computed and compared with the beam as found by test.—*General Electric Review*, October, 1926.

Hydro-Electric Development and Steam Equipment

Hydro-Electric Developments in Switzerland.—H. E. GICOT.—In Europe the science of hydraulics was first known in the South, although it is practically certain that it was brought there from the East. A rather long time elapsed before its applications were adopted in the North, but as far back as the eleventh century a great many mills existed in the south of Germany and in Switzerland. Hydro-electric development may be divided into three successive periods. At first every one worked independently without coordination of production and new hydraulic plants were established when required. The operation of such plants was based on minimum flow and consequently part of the power was lost. Electrical energy was produced thermally only when badly needed. As the need for electricity increased it became necessary to utilize the forces of nature in a more efficient way. Various hydro-electric plants were taken into the same network, and as a result it became the practice to design plants of different water flow, so as to supplement low-pressure plants having a great quantity of power in summer and a shortage of water during winter with others having high pressure and storage capacity. A new tendency has been developed in the last few years, constituting the third phase of development, namely, the idea of a "Swiss national network" to improve the relation between production and consumption by interconnecting a great number of networks, in order to balance their load and to help each other to attain economic generation of power for electrochemical industries or for exploitation. The energy production of all Swiss power plants now amounts to about three billions of utilized kilowatt-hours (1923). As the power plants could produce about five billions of kilowatt-hours, the actual production is therefore 60 per cent of the possible and represents 2¾ kw.-hr. per inhabitant per day. Particular reference is made by the author to the big waterpower plant at Grimsel, above the canyon of the Aare, which is now under construction. It will consist of an entirely artificial storage station of 113,000,000 cu.m., created with the help of two dams. The power houses will have a total power of 244,000 hp. and an annual production of more than 650,000,000 kw.-hr., the main part of which will be constantly available.—*World Power*, September, 1926.



DEVELOPMENT OF INSTALLED POWER IN SWISS POWER STATIONS, 1885-1925

Transmission, Substations and Distribution

Air-Blast Transformers. — L. H. BURNHAM.—The sale for this type of transformer is not great and most of its applications are special, according to the author. Designs having varied mechanical and electrical characteristics and unusual over-all dimensions must be produced to meet exceptional utilization requirements. Such transformers may be built in any capacity, single-phase and three-phase, for all frequencies and for operating voltages up to and including 27,500 volts. Above this voltage difficulty with corona is experienced unless special expensive features of design are incorporated to reduce the dielectric stress on the air. All designs are based on the shell type of core construction with vertical coils because this construction so readily lends itself to the air movement. Untaped coils are used, giving rapid and efficient heat transfer from the windings to the cooling air with a minimum temperature drop. The use of a construction that safely admits the elimination of tape on the coils is a particularly essential feature, for it prevents trouble caused by blistered insulation, which always hinders efficient cooling by the formation of air pockets and obstructs the cooling ducts. Some of the various applications for air-blast transformers are illustrated by the author in a number of examples. Air-blast transformers occupy less floor space and are lighter in weight than oil-insulated transformers, and for these reasons are well adapted for use in large cities where space is at a premium. A comparison between the

COMPARATIVE DATA ON TRANSFORMERS

	Water-Cooled	Self-Cooled	Air-Blast
Floor dimensions	85 in.x 79 in.	98 in.x 87 in.	51 in.x40 in.
Floor space	6,715 sq.in.	8,35⁄ sq.in.	2,040 sq.in.
Weight	26,700 lb.	39,300 lb.	19,500 lb.
Full-load efficiency	98.8 per cent	99.1 per cent	98.9 per cent
Cost	100 per cent	145 per cent	123 per cent

three types is given in the accompanying table.—*General Electric Review*, October, 1926.

Units, Measurements and Instruments

Economical Thickness of Dielectric in a Three-Core High-Tension Cable.—N. A. ALLEN.—Owing to the demand in recent years for the production of underground cables designed for much higher voltages than those which were used previously, a great deal of attention has been given to the problem of constructing these cables in such a manner that a maximum of utility is attained per unit of material employed in their construction. Relations originally worked out for single-core cables have frequently been used for designing three-core cables also. It is, however, felt by the author that these relations probably apply only to single-core cables, since they ignore in the case of the three-core cable the effect of bad insulation. An attempt is therefore made in this article to develop a formula which will be correct for three-core cables. The study is directed, first, to an examination of the conditions for "unearthed" cable having the same thickness of insulation between conductors and sheets as between conductors, and later on corresponding figures are added to include the case of "earthed" cable having the thickness of insulation between conductors and sheets reduced to three-quarters of that between conductors.—*World Power*, September, 1926.

Heat Applications and Material Handling

Utilization of Furnace Gases.—P. BUNET.—The author maintains that the carbon monoxide produced as by-product at most electric furnaces operating on the reduction principle should not be permitted to escape unused. It is not difficult to arrange the cope of the furnace in such a way as to catch these combustible gases and to utilize them as direct or motor fuel. Taking as an example the manufacture of calcium carbide, the paper explains the economies realized if the developed gases are caught and used. A similar example is given for electric steel furnaces. In the latter case 30 to 40 per cent of the energy required by the furnace can be regained from generators driven by gas motors, which operate from the exhaust gases of the furnace.—*Revue Générale de l'Electricité*, Aug. 28, 1926.

Refractories for Melting Pure Metals: Iron, Nickel, Platinum.—LOUIS JORDAN, A. A. PETERSON and L. H. PHELPS.—The Bureau of Standards has carried out a very systematic investigation of the refractory materials best suited for the melting of pure iron, nickel and the platinum metals. The nature or composition of the pure metal or alloy to be melted and the conditions under which it is required or it is convenient to melt it must be known before a proper choice of refractory for holding the molten mass can be made. Pure magnesia crucibles are suitable for pure iron and iron alloys, but usually the magnesia crucibles contain too much sulphur, readily absorbed by the iron. Zircon added to the magnesia greatly increases the strength of the crucibles. The zircon must be low in phosphorus. Pure iron melted in zirconia crucibles was found to have taken up large amounts of silicon. Crucibles made of "R. R. alundum" contaminated the iron by as much as 0.07 per cent silicon. Crucibles made of cp.MgO with $MgCl_2$ as binder proved to be most satisfactory for pure iron and iron alloys. The making of these MgO crucibles is described. These crucibles are likewise best suited for melting pure nickel. Crucibles made of zirconia, freed from carbon and acid-soluble iron, are suitable for melting pure platinum and platinum-rhodium alloys, provided that the melting is done under oxidizing conditions. The manufacture of zirconia crucibles is described. They are very hard and mechanically strong and withstand temperatures up to 2,000 deg. C., but must be heated and cooled slowly.—*Paper presented before American Electrochemical Society*, Oct. 11, 1926.

Electrophysics, Electrochemistry and Batteries

Magnetostriction in Permalloy.—L. W. MCKEEHAN and P. P. CIOFFI.—The materials studied comprise iron, nickel and permalloys containing 46, 64, 74, 78, 80, 84 and 89 per cent nickel. The method permitted simultaneous measurement of magnetization and magnetostriction in about 12 cm. at the middle of a 40-cm. wire, 1 mm. in diameter, in an approximately uniform field not exceeding 40 gauss, and either with or without applied tension (within the elastic limit). The magnetostriction was measured by a combination of a mechanical lever, an optical lever, a multiple slit and a photo-electric cell. The magnifying power of this combination, as used, was about 2×10, and magnetostrictive strains from 2×10 to 3×10 were detected and measured without changing the sensitivity. The paper presents a detailed discussion of measurement by this new method of changes in length due to magnetization of well-annealed nickel-iron alloys with and without applied tension.—*Reprint B201, Bell Telephone Laboratories*, August, 1926.

Traction

Vesuvius Railway.—F. ECKINGER.—A tourist railroad circling the base of Mount Vesuvius over a total trackage of 70 km. has now been completely electrified. Power is furnished from three central stations as three-phase, 42-cycle current at 2,000, 9,000 and 12,000 volts, which is changed in four motor-generator substations into 1,000-volt direct current. A single suspension catenary trolley line zigzags over the single-track road. Storage batteries in the substations provide emergency operation. The large motor cars are rated at 515 hp. and pull trains of ten trailers. One high-voltage controller is provided under the car and is operated by gear drive from either end. A motor-driven compressor supplies the airbrakes, while the illumination of all cars is derived directly from the trolley voltage by a suitable series connection of lamps. The popularity of the road is best shown by the fact that a total of six million passengers were carried during 1925.—*Brown Boveri Mitteilungen*, September, 1926.

Tractive Resistance of Electric Locomotives and Cars.—W. J. DAVIS, JR.—It was considered desirable and feasible to co-ordinate the diversified but valuable information which has been gathered from time to time as the result of experimental tests and the tractive resistance of standard types of freight and passenger cars of various weights and loadings under mild and severe weather conditions and to present its expressions in simplified forms which would cover nearly, if not all, practical operating conditions. With this object in view, the author has undertaken an analytical study of available tests and investigations in which descriptions of the cars and other necessary data have been given or could be found in some records. This article is not intended, according to the author, as a treatise on train resistance. He is merely passing on to others data and conclusions he has found of help in his work and in his understanding of the subject.—*General Electric Review*, October, 1926.

Telegraphy, Telephony, Radio and Signals

Methods of High-Quality Recording and Reproducing of Music and Speech Based on Telephone Research.—J. P. MAXFIELD and H. C. HARRISON.—This paper deals with an analysis of the general requirements of recording and reproducing sound without appreciable distortion. The storing or recording of sound requires, first, a mechanical system which will respond faithfully to the sound waves which are to be recorded. Then there is required some material in or on which this sound may be recorded and an intervening system which permits the sound waves to make the record in this material. In the usual case, and in that which is particularly discussed, there is a mechanical system which will vibrate in response to the sound which is to be recorded and directly through some mechanical linkage, or less directly through an electrical linkage, drive a cutting mechanism which will impress a wax record. In the opinion of the authors of this paper, the amount of power available to operate the recorder directly from the sound in the recording room is so small as to make the use of high-quality electrical apparatus with associated vacuum amplifiers of very distinct advantage over the acoustic method. The paper points out at length how many of the heretofore unsolved fundamental problems of sound recording and reproduction have been solved by the application of a detailed knowledge of telephone transmission theory. A detailed analysis is here made of the analogies between electrical and mechanical systems in the voice frequency range and a discussion of the resulting mechanical design is presented.—*Reprint B-204, Bell Telephone Laboratories*, August, 1926.

News of the Industry

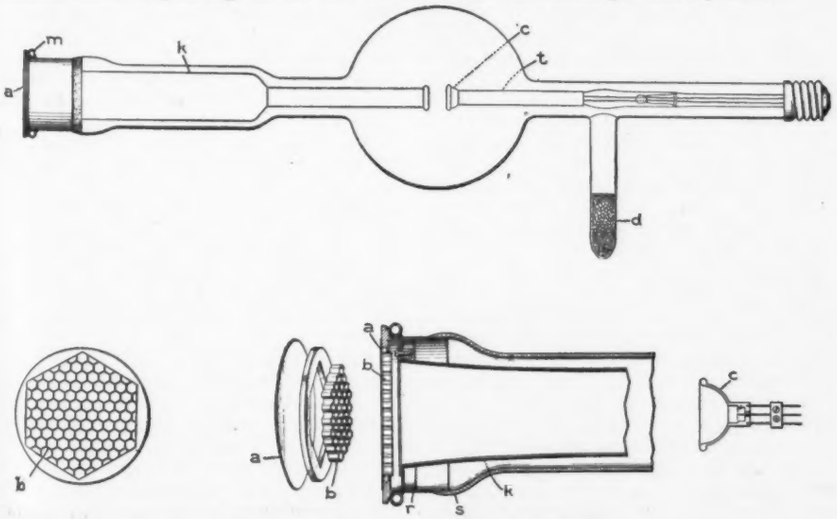
Demonstrates Enlarged Cathode Tube

Dr. W. D. Coolidge Explains Before the Franklin Institute His New Device That Operates at 350,000 Volts and Whose Rays Are Freed from Vacuum Tube

BEFORE the Franklin Institute, Philadelphia, on Wednesday evening, Dr. W. D. Coolidge, assistant director of the research laboratory of the General Electric Company at Schenectady, described the new cathode tube on which he has long been working and which is thought to contain potentialities of vast service to mankind. By this device it is possible to control streams containing countless billions of electrodes traveling at the rate of 150,000 miles a second. The highest development of the apparatus that Dr. Coolidge has yet made is operated at 350,000 volts, but he mentioned 2,000,000 volts as an ultimate possibility. The significance of the new tube lies both in this vastly enhanced power and in the fact that by means of a metal window the beta rays are freed from the vacuum tube and set free to act upon any object brought within their influence.

In developing the tube Dr. Coolidge adhered to the "metal window" idea of Lenard, the German physicist, but perfected it beyond anything that Lenard had anticipated. The tube displayed at Philadelphia has approximately a three-inch "window" of nickel foil half a thousandth of an inch thick. This exceedingly thin membrane is prevented from rupturing under the 100-lb. pressure caused by creation of the vacuum by a molybdenum support on the inner side. This support is perforated so as to offer the least possible obstruction to the outgoing rays. The nickel foil offers practically none.

DR. W. D. COOLIDGE



EXPLANATION OF CATHODE RAY TUBE

Upper—Diagram of tube.
Lower left—Construction of window.
Lower center—Details of window, shield and seal. Right—Section of cathode.

a. Anode window, a very thin piece of nickel foil, through which the electrons pass into the air.
b. Window support, a molybdenum hexagonal grid, to reinforce the window against the pressure of the atmosphere.
c. Hemispherical cathode cup, focusing the electrons released by the tungsten filament within the cup.
d. Charcoal trap for residual gases. When immersed in liquid air, the charcoal removes all traces of gas within tube.
k. Copper shield, preventing the electrons from striking the glass tube.
m. Water-cooling tube, to prevent the window from becoming heated.
r. Sleeve of invar, an alloy with about the same expansion as glass upon being heated. To this sleeve the anode is soldered.
s. Glass-to-invar seal.
t. Cathode shield.

Then Dr. Coolidge perfected the "hot cathode," which means that he heated one of his terminals before introducing his high-voltage current. Thus he increased the velocity of the electrons immensely. In the third place, he invented a means for maintaining the vacuum in the tube without the use of the cumbersome and elaborate pumps previously found necessary. Thus he made his apparatus portable. Finally he introduced voltage far beyond any attempted before.

The accompanying diagram explains the structure of the apparatus, whose power has been shown by its inventor in a series of experiments on gases, liquids, bacteria, insects, minerals and rabbits.

Dr. Coolidge is a native of Hudson, Mass., and was educated in the Massachusetts Institute of Technology and the University of Leipzig. He has been assistant director of the General Electric research laboratory since 1908. His work on the tungsten lamp and with the X-ray is known to all electrical engineers.

Merger of Indianapolis Companies Projected

Appearing before the Indiana Public Service Commission on Wednesday, an attorney for the Merchants' Heat & Light Company of Indianapolis said that a petition would be filed in a few days for authorization of a merger of that company and its competitor, the Indianapolis Light & Heat Company. The proposed new corporation, he said, would be capitalized at $50,000,000. The Merchants' Heat & Light Company is owned by the Insull interests, which acquired it in 1924. Last spring these interests also acquired for the Middle West Utilities Company an interest, but not a controlling one, in the Indianapolis Light & Heat Company.

Two 40,000-Kw. Units for Colfax Generating Station

Two similar units with a total rating of 80,000 kw. are soon to be added to the equipment of the Duquesne Light Company of Pittsburgh. These machines will be installed in the company's Colfax station. Foundations have already been laid, and the first one is expected to go into operation in the summer of 1927. They will bring the total rating of the plant to 270,000 kw.

Ground was broken for the Colfax station in 1919, and since then an almost continuous construction program has been carried forward. As originally planned, the ultimate development was to consist of six 60,000-kw. units. The first two units that were installed are of this capacity. The third and fourth units are 35,000-kw. machines.

The first two units are identical with

the exception of some minor detail and some of the auxiliary equipment. They are compound units having one high-pressure and two low-pressure elements, each driving a 20,000-kw. generator. The third and fourth units are separate 35,000-kw. single-cylinder turbines connected to a common bank of transformers. The fifth and sixth units will be similar to them in design, except that the rating of the turbines and generators will be higher.

Fourteen stoker-fired boilers were provided to furnish steam for the first two units. The subsequent installation consisted of five boilers fired with pulverized fuel. Improvements in design of the third and fourth units and changes in the first and second have resulted in an improvement in heat economy which, when converted into tons of coal consumed, was equal to a saving of 85,000 tons of coal for the 1925 power output.

Investment Bankers and Utility Issues

Savings Bank Acts Approved—Boulder Canyon Bill Condemned—Uniform State Regulation Indorsed—Holding Company Reports Criticised—Reduction of Return Opposed

BANKERS from all parts of the United States assembled at Quebec on Oct. 11 to Oct. 15 for the fifteenth annual convention of the Investment Bankers' Association of America. Many committees submitted comprehensive reports. One of these was the committee on public service securities. After condemning the "Giant Power" plan in Pennsylvania and the proposed amendment to the Oregon constitution designed to set up a state water and power board, the report made a number of comments and suggestions on questions affecting public utilities. Portions of these follow:

"A step of very considerable importance in the past two years has been the passage of laws in the States of Massachusetts, Connecticut and New Jersey admitting public utility bonds which conform to certain specified and rigid requirements as legal investments for savings banks. A similar bill was before the New York State Legislature this year, but failed of passage. There is beyond question a great amount of public utility bonds outstanding which are entirely suitable for the investment of savings bank funds, and with the progress of the industry and the growth in individual companies the amount of such bonds will increase. Such legislation, therefore, would afford the banks a proper and wider field of selection for their investments and would make available also to a sound and essential industry large additional amounts of private capital. We have no hesitation in recommending it on general principles and in suggesting to the different groups their active cooperation in the preparation and passage of such measures.

"In the bill introduced into Congress known as the Boulder Canyon project act, which provides for a large irrigation and hydro-electric development on the lower Colorado River to be constructed and operated by the government, there is involved in our opinion the definite principle of government ownership and operation, which should be combated and defeated at its beginning, particularly as there is a sound solution at hand under the provisions of the existing federal water-power act.

"The national conference of commissioners on utility state laws has for some time been engaged in drawing up a proposed uniform law for the regulation of utilities. An examination of the proposed bill does not show any points to which we could have serious objection, and it would of course be of very distinct advantage to all concerned if the law on this subject were uniform in all states. In some few states this regulation is still only required of common carriers, and we would recommend to the succeeding committee that an effort be made through the groups to have these remaining states brought into line.

"The annual reports of some of the leading operating companies are models. While lacking in some of the statistical operating figures which feature the railroad reports and are not yet standardized, they nevertheless give an excellent statement of the companies' affairs in a form well suited for the general public. It is to be regretted that a similar comment cannot be made regarding the holding companies, for while some of these have made a good start in this direction, there is still much room for improvement. The influence here upon the general public, and the necessity for that reason, is, of course, less than with the operating company with its local contact, but the obligation to the investor is equally great. If in no other way, the reward would surely be sufficient if they could avoid the burden of public antagonism under which the railroads have labored so long. To achieve this their house must rest always on three foundation stones—good service, honest financing and frankness with the public and the investor.

"In April the people's counsel, an appointed state officer, applied to the Maryland Public Utilities Commission for a reduction in the rates of a large electric light and power company in that state, basing part of his case upon the argument that the rate of return allowed to the company upon its agreed valuation should be reduced from the present 8 per cent to 6¾ per cent. Evidence has been taken and the case is now awaiting decision. Any tendency toward a reduction in the accepted rate of return will undoubtedly seriously impair the ability of the utility companies to raise money by equity financing, thereby weakening their financial structures, resulting in higher financing costs and forced economies of operation at the expense of good service to the public. Conversely the importance of maintaining these equities must be held in mind by the managements and the danger recognized if they become to too great an extent transferred into fixed interest-bearing obligations, and also if the proper amount of earnings is not plowed back into the property. The maintenance of the present high standard of service by the utility companies is of prime importance to the investor and the public, and the association deems it to be for the best public interest that the present accepted rate of return on capital as applied to public utility companies remain undisturbed."

More than a hundred of the delegates were taken on a tour of the St. Maurice Valley and surrounding territory, where they visited some of the principal power and industrial developments in the province.

Kansas Women to the Fore

Send 50 Delegates to State Meeting of N.E.L.A.—Rural Service and Safety Are Topics

"WHAT the American farmer needs is less legislation and more electricity," Prof. H. B. Walker, retiring president of the American Society of Agricultural Engineers, told the two hundred public utility men and women attending the twenty-ninth annual convention of the Kansas Section, N.E.L.A., held at Manhattan on Oct. 14, 15 and 16. Professor Walker, head of the department of agricultural engineering at the Kansas State Agricultural College, Manhattan, is secretary, treasurer and state supervisor of the Kansas Committee on the Relation of Electricity to Agriculture and has had part in the progress of that organization as set forth in ELECTRICAL WORLD for Oct. 9 (page 770). He also represents the American Society of Agricultural Engineers on the American Engineering Council. "Results already obtained on the nine experimental electrified farms undergoing study in Kansas and facts deduced from similar experiments in other states must lead us to conclude that American agriculture will eventually be electrified to the profit both of the farmer and the power company," he declared.

Speaking on "Farm Burdens and Electrical Energy," Dr. F. D. Farrell, president of the Kansas State Agricultural College, asserted that "contrary to popular opinion, the farmers of America are quick to adopt new methods, and this tendency will promote increased use of electricity to supplant the older and less efficient farm practices."

Characterized by C. A. Fees, president of the Kansas Section, N.E.L.A., as "the most noteworthy accomplishment of the year in the public service industry of Kansas," the work of the women employees of light and power companies in the state held the convention stage for an entire afternoon and evening. From an unorganized group public utility women of Kansas have been brought together in thirteen active committees, representing every company of any magnitude in the state and having a combined membership of more than two hundred. This attainment, achieved within a period of six months, was credited by convention resolutions to Miss Ainslie Anthony, Kansas Power

& Light Company, Topeka, who is chairman of the Kansas women's committee and head of the women's committee of the Middle West Division, N.E.L.A. More than a fourth of the convention delegates were women.

Accident prevention assumed unusual importance as a topic with the presentation to Paul Elbert, Manhattan employee of the United Power & Light Corporation, of an Insull medal for saving the life of a fellow workman. The medal, the second of its kind in Kansas, was presented by W. S. Vivian, Chicago, personal representative of Samuel Insull, donor of the award. A playlet, "Hot Wires," was given under the direction of H. D. Harper.

Chief among non-routine features was the address at the annual dinner of Ewing Herbert, veteran Kansas newspaper editor, who was responsible for bringing to Hiawatha, Kan., his home, one of the first electric light and power plants to begin operation in the state.

Among other speakers were Horace M. Davis, Lincoln; Col. Robert H. Timmons, Wichita; Dr. Howard T. Hill, Manhattan; Miss Margaret Lienard, Lawrence; Mrs. Harry Van Ness, Wichita; Elliott Belden, Abilene; Prof. E. V. Floyd, Manhattan; Prof. Walter Burr, Manhattan; Mrs. Garnette Reynolds, Topeka; Keith Clevenger, Bartlesville, Okla.; Miss Eleanor Shaefer, Topeka, and W. S. Vivian, Chicago. Secretary of Agriculture Jardine and M. H. Aylesworth, managing director N.E.L.A., who had accepted places on the speaking program, found it impossible to be present.

Because four other conventions were being held in Manhattan at the same time, one of them bringing approximately 4,000 delegates, accommodations were assigned in private homes to many public utility men and women and impromptu quarters were established by the Chamber of Commerce.

Officers elected at the close of the convention are: President, H. D. Hayden, district manager United Power & Light Corporation, Salina; first vice-president, Arthur H. Groesbeck, district manager United Power & Light Corporation, Manhattan; second vice-president, Ralph T. Smalley, assistant general manager Kansas Electric Power Company, Lawrence; treasurer, P. F. Gow, treasurer Kansas Gas & Electric Company, Wichita; secretary (re-elected), H. Lee Jones, director public relations, state utility association, Topeka.

The next annual meeting of the Kansas Section probably will be held in Topeka next May in conjunction with the annual convention of the Middle West Division, N.E.L.A.

Kearny Station's Fifth Unit Goes Into Service

The placing in service by the Public Service Production Company of turbo-generator No. 5 at the Kearny (N. J.) power station on Oct. 7 leaves little of the first half of the station to be completed. Work is progressing rapidly on the remaining equipment, which includes primarily the coal-handling plant and additional boiler facilities, and at an early date the entire installation will be in operation by the Public Service Electric & Gas Company. Unit No. 5 has a rating of 39,200 kva. at 80 per cent power factor, 13,200 to 14,200 volts, three-phase, 60-cycle, and is of General Electric manufacture. This gives the first section of the station a capacity of 205,100 kva., comprising two Westinghouse 43,750-kva. and three General Electric 39,200-kva. turbo-generators.

The switch house at this new station, whose salient electrical features were described in the issue of the ELECTRICAL WORLD of Aug. 28, embodies the latest improvements to insure continuity of service and safety, including not only vertical phase isolation and duplicate buses, but also entire segregation of oil-immersed apparatus from other equipment and complete interlocking of oil circuit breakers, disconnecting switches and compartment doors.

No License Yet for St. Lawrence Plant

New York Water Power Board Postpones Till Next Week Presentation of Applicants' Financial Schemes—Candidates for Governor Argue on Hydro Plans

IN ORDER to give the two applicants for a license to develop St. Lawrence River water power—the St. Lawrence Valley Power Corporation, all of whose stock is declared to be now owned by the Aluminum Company of America, which has contracted to sell it to the Frontier Corporation, and the American Super-Power Corporation—an opportunity to present a picture of the financial structures they propose to build to provide funds to complete the project, if a license be granted to either applicant, the hearing of the New York State Water Power Commission was on Friday, Oct. 15, adjourned until Monday, Oct. 25.

The Frontier Corporation offered in evidence a map showing a complete system of interlocking transmission lines covering almost the entire state of New York outside of New York City and Long Island and stated that it had tentative agreements with the electrical organizations owning such interlocking systems to take and distribute the energy when generated.

Edward C. Randall, president of the American Super-Power Corporation, testified that his company proposed to build one transmission line to the borders of the city of New York and that the New York Edison Company with five associate companies would be the beneficiary of the energy conveyed. Mr. Randall further said that, if his company were granted a license, it was proposed to build a second transmission line of 220,000 volts capacity to carry 300,000 hp. from the St. Lawrence into the counties of the southern tier and that it would be possible to transmit such electricity and sell it in New York City and the southern tier counties at a favorable price in competition with steam plants.

Over the protest of Fay C. Hamilton, chief executive officer of the Henry L. Doherty Company, New York, which owns a third of the stock of the American Super-Power Corporation, that Nov. 8 would be the earliest date on which a picture of the financial structure could be properly presented, the date of the next meeting of the commission was fixed, as stated above, for Oct. 25, both Senator John A. Knight, president pro tem. of the Senate, and Roy G. Finch, state engineer and surveyor, insisting upon the need of speeding up action. That the commission is determined to take definite action in relation to the granting of a license, and before election if possible, may be a reasonable inference.

Before adjourning the commission adopted a resolution by Senator Knight providing in effect that if in the future, after development has been made, the Public Service Commission or other regulatory body should fix the rates to be charged for the electricity sold to the public at a figure which would wipe out the annual rental charge of $2.25 per horsepower to be paid to the state and would eat into the fund provided for amortization purposes, the Water Power Commission and the state should have the option at the end of the term of the lease either to contribute a sufficient sum to make up the deficit so created in such fund in order to permit the state to acquire the property, or to extend the lifetime of the lease for such term of years as would enable the corporation at the reduced annual amortization saving to retire fully all of its obligations of indebtedness.

SMITH AND MILLS ARGUE

Development of state water powers is playing a part in the contest for governor now being waged in New York State. Governor Smith, who seeks re-election, is making in defense of his policy speeches which contain statements to the following effect:

"I have advocated the creation by law of a state Water Power Authority, municipal in character, having no stockholders, deriving its powers from the state and having placed upon it the duty to take over and develop the state's power resources in accordance with a plan to be submitted to the Legislature for approval by law.

"Such a public corporation should be given the power to issue bonds to be sold to private investors which would be exempt from state taxation and would be secured by the revenues to be derived from the improvements when made. In this way the valuable franchises which the state itself would own would be capitalized not in the interest of private stockholders but in the interest of the public. Under such a plan neither the money nor the credit of the state need be pledged, and it does not mean that the state is going into the business of dealing in electrical energy with the ultimate consumer. All that is required is that the state itself shall own and control the development at its source. The ultimate disposition of the power will be a part of the plan sub-

mitted to the Legislature for approval by the Water Power Authority.

"There is, therefore, nothing to the contention that I am endeavoring to put the state in the business of distributing electrical energy. What I do, however, insist upon is that the land, flowage, dams, water rights and power houses remain the property of the people of the State of New York. In this position I am supported by no less an authority on water power than Owen D. Young, chairman of the board of directors of the General Electric Company."

Representative Ogden L. Mills, Mr. Smith's Republican opponent for the Governorship, has this to say:

"The Governor seeks to distinguish operation by the state government itself from operation by a corporation complete ownership and control of which is vested in the state government. Legally, there may be a distinction. Practically there is none. Consider the set-up of this state power corporation. It would, presumably, be run by a board of directors and an executive named by the Governor. That the latter would endeavor to find men and women who know something about the power business is, of course, to be expected. But is there any doubt that they would also be selected to represent political groups, a consideration that has no relation whatsoever to efficient operation of a business enterprise?

"To begin with, the capital cost, the construction costs, are always greater when the government builds than when private individuals or corporations do. The purse of the state is always considered so inexhaustible. There is neither the same incentive to save nor the sheer necessity forced on private corporations by competition or regulation. The estimates of government construction are nearly always exceeded. Moreover, in the case of blunders and mistakes, when they are made by private utility companies the burden cannot be shifted to the consuming public in the rates, certainly not under the federal or state water-power acts, nor, as a matter of fact, where there is a public utility commission with such power as our New York commission has. They must be borne by the investors, because rates are filed on the value of the property actually useful and used in the enterprise."

Utilities Commissioners Will Discuss Water Power

Asheville, N. C., has been selected as the place for the thirty-eighth annual convention of the National Association of Railroad and Utilities Commissioners, which will be in session from Nov. 9 to Nov. 12 inclusive. Railroad rates, interstate operation of motor-buses, federal and state commission co-operation and water power will form the chief subjects for deliberation. Adolph Kanneberg of the Wisconsin Railroad Commission will present the report of the special committee on water power, which will be discussed at a "round-table conference" on Tuesday evening, Nov. 9.

Addresses will be made by prominent men, including William A. Prendergast, chairman of the New York State commission, who is also chairman of the association's public utility rates committee; John A. Small, president of the National Rivers and Harbors Congress; John J. Esch, member of the Interstate Commerce Commission; Alexander Forward, secretary-manager of the American Gas Association; H. A. McKeown, chief commissioner of the Canadian Board of Railway Commissioners; C. C. McChord, former chairman of the Interstate Commerce Commission; Edward W. Bemis, consulting engineer, Chicago, and M. H. Aylesworth, retiring managing director of the National Electric Light Association. Mr. Aylesworth will discuss the electric light and power industry and, possibly, the regulation of radio; Mr. Forward will talk on public information in utility regulation, Mr. McKeown on regulation in Canada, and Mr. Bemis on "going value" in rate cases.

Industry Wiring Conference Defines Issues

"All-Metal Standard" Controversy Provides the Subject for First Meeting of New Body—Committee of Five Appointed to Ascertain Facts

ECONOMIC factors underlying the present controversy between the National Electric Light Association and the Association of Electragists International on the subject of the Electragists' all-metal wiring standard and its effects on the expansion of house-wiring business provided the subject of discussion at the first meeting of the Electrical Industry Conference on Wiring, which was held at the Engineers' Club, New York City, on Oct. 15. The issues before the conference were:

1. Is the all-metal wiring standard, as installed in practice, usually or normally more expensive than non-metallic wiring methods?

2. Does the all-metal standard, be it more or less expensive, restrict or not restrict the market for wiring?

Statements were presented by the chairmen of the delegations representing the National Electric Light Association, the National Electrical Manufacturers' Association, the Electrical Supply Jobbers' Association and the Association of Electragists International, followed by general discussion of the points brought out, and an executive committee was appointed comprising the four delegation chairmen and Earl E. Whitehorne, chairman of the conference, to collect and compile information and facts bearing on the issues in controversy. When this executive committee has its report ready a further meeting of the full conference membership will be called.

Present at the initial meeting of the Wiring Conference were:

Representing the central-station companies: W. H. Blood, Jr., Stone & Webster, Boston; A. P. Good, Commonwealth Edison Company, Chicago, chairman wiring committee N.E.L.A.; J. D. Noyes, engineer, Detroit Edison Company; Charles J. Russell, vice-president Philadelphia Electric Company.

Representing the manufacturers: H. R. Sargent, engineer, General Electric Company, Bridgeport, Conn.; R. C. Myer, Habirshaw Wire & Cable Company (alternate for W. E. Baker, United States Rubber Company, New York); C. A. Bates, engineer, Bryant Electric Manufacturing Company, Bridgeport; W. E. Sprackling, vice-president Tubular Woven Fabric Company, Pawtucket, R. I.

Representing the jobbers: W. R. Herstein, vice-president Wesco Supply Company, Memphis; O. F. Rost, president, Newark (N. J.) Electrical Supply Company; Martin Oberlander, representing G. A. Cullinan, vice-president Graybar Electric Company, New York; McKew Parr, president Parr Electric Company (alternate for W. I. Bickford, Iron City Electric Company, Pittsburgh).

Representing the contractors: J. A. Fowler, president Fowler Electric Company, Memphis; A. P. Denton, president Denton Engineering Company, Kansas City; W. C. Peet, president Peet & Powers, New York; G. E. Shepherd, president Shepherd-Rust Electric Company, Wilkes-Barre, Pa.

Technical advisers: Joseph C. Forsyth, New York Board of Fire Underwriters; Alexander Maxwell, National Electric Light Association; H. B. Kirkland, Society for Electrical Development; Laurence W. Davis, general manager Association of Electragists.

FIRST GATHERING OF INDUSTRY CONFERENCE ON WIRING

Left to right seated: W. R. Herstein, chairman Electrical Supply Jobbers' Association delegation; C. J. Russell, chairman National Electric Light Association delegation; Earl E. Whitehorne, chairman of the conference; J. A. Fowler, chairman Association of Electragists International delegation; H. R. Sargent, chairman National Electrical Manufacturers' Association delegation. Left to right standing: Alexander Maxwell, S. A. Dennis, O. H. Caldwell, J. C. Forsyth, H. B. Kirkland, L. W. Davis, M. A. Oberlander, C. T. Hutchinson, C. A. Bates, A. P. Denton, W. E. Sprackling, W. C. Peet, J. D. Noyes, A. P. Good, G. E. Shepherd, W. H. Blood, Jr., O. F. Rost, R. C. Myer and Nelson Bond.

Progress on Chelan Project

Excavation Work More than Half Done —First 32,000-Hp. Unit May Start up Next Summer

PROGRESSING more rapidly than anticipated, excavation work on the main tunnel of the Lake Chelan project of the Washington Water Power Company, which acquired the rights of the Chelan Electric Company in central Washington, was more than half done on Sept. 21, the totals showing 5,595.5 ft. of excavation completed and 5,509.5 ft. to be done. Excavation on the power house and surge-tank sites was more than half done at that time, and a cofferdam was begun at the dam site. It is hoped to have the first unit of 32,000 hp. in operation by midsummer of 1927. Ultimately the rating may reach 100,000 hp. or more and the plant cost $10,000,000. More than 900 men are being used by the contractors. The tunnel, when lined with concrete, will have an inside diameter of 14 ft. and will be large enough to supply two units in the power house.

Plans for the dam were adopted after several months of experimenting with a miniature wooden dam in the Spokane River in front of the company's steel diversion dam near Division Street, Spokane. The big problem at the Chelan dam was to devise a structure in which the flood and surplus water running over the crest of the dam would not wash away the gravel surface in front of the structure.

With the aid of this miniature dam, built with gates, spillway and downstream apron, a plan was devised that is unique so far as Washington Water Power dam structures are concerned. Two reinforced-concrete baffles, the first 6 ft. high and the second 4 ft., were built in the downstream apron to reduce the velocity and eliminate some of the energy of the water that flows over the dam. The result was a dam in miniature in which the escaping water was brought under control and reduced to the docility of an ordinary level stream.

Water for these experiments was furnished through one of the gates in the Division Street diversion dam. The miniature dam was built on a scale of twenty to one, as compared with the permanent dam to be built in the Chelan River. The action of the water at each stage in the experiment was observed and photographed and the extent of the "kick" in the water was shown in the different pictures.

With the plans approved, work has started on the cofferdam in the Chelan River that will hold the flow of the stream in check while the power dam is being built. The dam will be a quarter of a mile below the outlet of Lake Chelan. It will be 300 ft. in length and 28 ft. in height above the surface of the river. The intention is to speed the construction during the low-water period so that the dam will be completed by next March. A reinforced-concrete structure will rise 18 feet above the river, and on top the water will be controlled by a set of steel gates 10 ft. high. The total length of the downstream apron is to be 150 ft. The intake to the 14-ft. tunnel that is to carry the water of Lake Chelan to the new power plant near the Columbia River is being constructed to the right of the dam.

Program of Regional A.I.E.E. Meeting in New York

The two-day regional meeting of the American Institute of Electrical Engineers to be held in New York City on Nov. 11 and 12 will comprise three technical sessions covering the subjects of alternating-current distribution networks, illumination and communication. In addition there will be a lecture by some well-known scientist on the evening of the first day. Following is the tentative program:

THURSDAY, NOVEMBER 11

Morning.—Distribution session: "Recent Progress in Distribution Practice," J. F. Fairman and R. C. Rifenburg, Brooklyn Edison Company; "Combined Light and Power Systems for Alternating-Current Secondary Networks," H. Richter, Westinghouse Electric & Manufacturing Company; "Evolution of the Automatic Network Relay," J. S. Parsons, Westinghouse Electric & Manufacturing Company; "Operating Requirements of the Automatic Network Relay," W. R. Bullard, Electric Bond & Share Company; "Alternating-Current Network Relay Characteristics," D. K. Blake, General Electric Company.

FRIDAY, NOVEMBER 12

Morning.—Illumination session: "Remote Control of Multiple Street-Lighting Systems," W. S. Dempsey, New York Edison Company; "Lighting of Railway Classification Yards," G. T. Johnson, New York, New Haven & Hartford Railroad; "The Induction Lamp, a New Source of Visible and Ultra-Violet Radiation," T. E. Foulke, Cooper Hewitt Electric Company.

Afternoon. — Communication session: "Frequency Measurements with the Cathode-Ray Oscillograph," F. J. Rasmussen, Bell Telephone Laboratories; "A Shielded Bridge for Inductive-Impedance Measurements," W. J. Shackelton, Bell Telephone Laboratories; "Radio Broadcast Coverage of City Areas," L. S. Espenschied, American Telephone & Telegraph Company.

It has been determined by the committee in charge of the midwinter convention of the Institute, to be held at New York on Feb. 7 to Feb. 10, 1927, to devote one session to discussing the standardization of voltages—particularly high voltages—a topic held to be of great and increasing importance.

Big Meadows Dam Is to Be Finished This Year

The Big Meadows Dam on the Feather River in California will be completed in December, according to the North American Company, the holding concern back of the project. Less than 150,000 cu.yd. of fill remain to be placed in the main body of the dam. Run-off water from a 500-square-mile watershed in California will be stored behind this new dam early next year. The completion of the Big Meadows Dam will increase the storage capacity in Lake Almanor from 300,000 to 1,300,000 acre-feet, making this lake rank with the largest water-power reservoirs in the world. It gives to the California territory it serves a potential development of 1,000,000 hp., and the water which can be stored behind it during the wet season will be available for several consecutive dry seasons.

Two power plants, Caribou and Las Plumas, are in operation by the Great Western Power Company, now a North American subsidiary, with a combined capacity of 175,000 hp. Eventually eight more plants will be erected on strategic points below Lake Almanor, using its waters over and over again at various heads. After the stored water has passed through generating plants it flows down the Sacramento Valley, where it is distributed for irrigation over more than 25,000 acres of land. Through opening of the North American system's new tie-line interconnecting the Great Western and San Joaquin Power companies, a large part of this power can be diverted to the San Joaquin Valley.

Water-Power Development and Scenery Preservation

Protests against the project of the Cumberland Hydro-Electric Company for a plant at Cumberland Falls, Ky., continue to reach Washington. Suggestions that conditions be put in the license that the power company repair the ravages of nature and rebuild the crest so as to insure the maximum of scenic effect, and that a sufficient volume of water be released to maintain the falls in full grandeur during daylight hours and on moonlight nights, do not satisfy the objectors, who seem to give no weight to the argument that the reservoir would itself make the falls a year-around object of beauty, whereas at present the scenic effect is lost completely during the low-water season.

There is a feeling on the part of many champions of water-power development that alleged marring of scenic beauty has been employed so successfully in delaying the carrying out of projects that it is becoming the standard resource for the opponents of such projects. The latest instance in which beauty has been dragged in by the heels, as it were, is in connection with the application by the Wisconsin Power & Light Company for rights on the Wolf River. The proposed reservoir encroaches upon the Menominee Indian reservation. Representations are made that this part of the reservation is one of nature's garden spots and should be protected.

Opponents of Plants on Indian Reservation Disagree

Vigorous opposition was encountered by the Wisconsin Power & Light Company at a public hearing held in Milwaukee two or three weeks ago by the United States district engineer in connection with the company's application for permission to develop five water-power sites, at a cost of approximately $3,000,000, on the Wolf River within the borders of the Menominee Indian reservation. Four members of the tribe who testified failed to agree. Some others who testified wanted the Indians themselves to develop the power; another faction favored the granting to the power company of priority rights for a three-year survey and license to construct dams, and others demanded that the bidding for rights be competitive, that the state buy the tribal lands along the Wolf River and establish a park to preserve the scenic beauties of

the stream. Attorneys for the company argued that the electrical development of the state was of more importance to the people than the scenic and fishing attractions of the river. Superintendent Downer of the reservation declared that the majority of the Indians with whom he had talked on the subject were in favor of the sale, which would mean the development of 60,000,000 kw.-hr. of electricity each year.

Talk of Two New Large Hydro Plants in Canadian West

Canadian newspapers are predicting that the Winnipeg Electric Company will in the near future begin to develop the great power site at White Mud Falls on the Nelson River, it being held that this was what A. W. McLimont, president and general manager of the company, had in view when he said recently that plans were being matured for a power plant "of greater capacity than any of the plants at present serving Winnipeg." The company's plant at Great Falls, which has a capacity of 168,000 hp., is the largest on the Winnipeg River. The English River furnishes no great power sites. Only the Nelson River locations, which, it is said, could be made to develop 2,500,000 hp., would appear to come under Mr. McLimont's designation. The Mud Falls site on the Nelson River has a minimum-flow capacity put at 180,000 hp. and a maximum capacity of 250,000 hp. It is directly north of Winnipeg, from 300 to 400 miles away, depending on the direction a transmission line would take. It is contended that a plant at that point could be made to serve Hudson Bay railway undertakings. Power in this region would also be a great asset in connection with the prospective development of the Flin Flon mine in the neighboring zinc-copper properties. Such a scheme would also permit power to be delivered to the mining district east of Lake Winnipeg in the central Manitoba region.

In an interview recently, G. A. Gaherty, managing director of the Calgary Power Company of Calgary, Alberta, said that that company was in a position to proceed with the construction of a power reservoir in the valley of the Spray Lakes, southeast of Banff. He said the construction of the reservoir would mean the expenditure of more than a million dollars. The Calgary Power Company first applied for a license to proceed with such a development six years ago. The Province of Alberta also applied for a license at the same time. The Dominion government took the stand that Alberta should have priority, but demanded that the province, just as an individual or company, should demonstrate its good faith and ability to carry out the proposed development. According to Dominion government officials, the province has failed to do this up to the present; therefore the license has been withheld. The construction of the reservoir would mean a great augmentation of water supply for the plants of the Calgary Power Company on the Bow River in the winter months.

Purchases and Mergers

Many States Represented in New Small Transactions, but No Outstanding Sale or Consolidation

APPROVAL of the merger of the Insull companies in New Hampshire into the Public Service Company of New Hampshire has been given by the Public Service Commission of that state, in accordance with the application recorded in the ELECTRICAL WORLD for Sept. 18, page 594. The acquisition by the Insull interests of the Hortonia Power Company of Brandon, Vt., at receiver's sale was noted last week (page 818), under a separate heading.

Sale of the Salmon River Light & Power Company, with head offices at Salmon, Idaho, by W. A. Monroe of Spokane, H. H. Boomer and C. H. MacKenzie of Colfax, to investors interested in the Idaho Power Company has been announced in Spokane by Mr. Monroe, the consideration being about $100,000. The new property will add a producing mining district and a rapidly growing agricultural district to the system of the Idaho Power Company.

The Utah Power & Light Company has taken over the property of the Moab Power & Light Company at Moab, Utah, with about 175 customers.

The California Railroad Commission has authorized the People's California Hydro-Electric Corporation to issue not exceeding $35,000 of stock and not exceeding $65,000 of bonds for the purpose of acquiring the properties of the Fort Bragg Electric Company. The applicant had applied for permission to issue $225,000 in securities for this purpose. The Fort Bragg company serves that city and also furnishes energy to Mendocino.

The North Branch (Mich.) Electric Works, previously owned by R. G. Green, have been purchased by F. R. Ryan, who has discontinued the steam plant and will get power from the 23,000-volt lines of the Michigan Electric Power Company through a substation at Clifford, Mich. The North Branch Works serve the towns of North Branch, Mayville and Silverwood and adjacent territory and wholesale power to Clifford.

A petition to transfer an electric service franchise granted by the Town Board of Blooming Grove, N. Y., from the Central Hudson Gas & Electric Company to the Orange & Rockland Electric Company has been granted by the New York Public Service Commission.

Sale of the Community Light & Power Company, operating in Quakertown, N. J., and vicinity, to the New Jersey Power & Light Company has been approved by the Board of Public Utility Commissioners of that state.

The Central Illinois Public Service Company has received permission to buy the electric plants at Liberty, Mendon and Paloma, Ill., which will be served from Quincy, Ill.

Residents of Milton Junction, Wis., have voted 273 to 32 in favor of selling its municipal electric and water plant to the Wisconsin Power & Light Company, from which the city has been purchasing all its electrical energy.

Other municipal plants which have been or are soon to be taken over by electric light and power companies include that at Oklee, Minn., where the voters have approved sale to the Utilities Power & Light Corporation of Chicago; that at Florida City, Fla., where the Florida Power & Light Company is to have a 30-year franchise, and those at Weatherford and Sayre, Okla., which have been acquired by the Southwestern Light & Power Company of Oklahoma City. The sale of the Weatherford plant was approved on Oct. 12 by a vote of 361 to 78 and the sale of the Sayre plant on Oct. 7 by 348 to 21.

Two New Handbooks Added to Electrical Safety Code

Two new handbooks, Nos. 8 and 9, of the Bureau of Standards have just been issued. They form part of the latest revision of the National Electrical Safety Code, which is being issued in separate parts and will later be printed in combined form.

Handbook No. 8 is made up of safety rules for the operation of electrical equipment and lines. Rules are given for employees doing general and specialized work in electrical supply stations and on supply and communication systems. Handbook No. 9 contains safety rules governing radio installations. Copies of the handbooks may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 15 cents each for No. 8 and 10 cents for No. 9.

New Lighting System Inaugurated in State Street, Chicago

One of the most brilliant street illuminations to be seen in any city came into existence on Oct. 14 when the President pressed a button at the White House which inaugurated the lighting system just constructed in State Street, Chicago. There are 140 lamps with a rating of 2,000 watts each in the mile stretch from Lake to Van Buren Street, and these have been installed in pairs along the curb, making the street in many places brighter than the interiors of stores which line it. The new system cost $100,000.

State Street now has approximately 1,800 lumens per lineal foot of street, which, it is said, is twice the rating of the most intensive street-lighting system hitherto installed. Seventy specially designed ornamental Union Metal standards have been placed in the "Loop" district, each standard carrying two of the lamps with the light center nearly 28 ft. above the sidewalk. The standards, arranged on both sides of the street and opposite each other, are approximately 100 ft. apart. The system, operating as a 110-volt, direct-current, three-wire one, is remotely controlled from a central point, a number of magnetic contactors being installed along the route. In most instances there is a contactor for each pole, but in some locations one controls two or three poles. The contactors are connected to a three-wire control system operated from the 220-volt side. All the lamps operate until 1 a.m.

Briefer News

Balch Power Tunnel Holed Through.—Holing through of the tunnel on the Balch development of the San Joaquin Light & Power Corporation on Oct. 11 was marked by fitting ceremony. Work on the tunnel was begun Sept. 15, 1925. It is 19,350 ft. in length and 12 ft. x 12 ft. in cross-section. The Balch plant now under construction will contain one 33,000-kva. unit operating under an effective head of 2,381 ft. and is scheduled for completion early in 1927.

Beatrice (Neb.) Municipal Ownership Plan Halted.—Injunction proceedings brought by taxpayers have halted the effort of the Beatrice (Neb.) City Council to issue $920,000 of light revenue bonds with which to buy the power plants of the Gage County Electric Company and to take over by condemnation the distribution system within the city of the Nebraska Gas & Electric Company (see ELECTRICAL WORLD for Oct. 16, page 822). This presages long litigation.

West Missouri Power Company Retains Its Properties.—The suit filed by the Missouri Power & Light Company to secure a court order to oblige the West Missouri Power Company to complete a sale of its properties to the former company, referred to in the ELECTRICAL WORLD for Aug. 14, page 342, has been voluntarily dropped by the Missouri Power & Light Company, and the present control of the West Missouri Power Company, of which L. K. Green is president and general manager, will be retained.

Ontario Government Contributes a Million Toward Rural Electric Service.—The contribution of the Ontario government to the extension of hydro-electric power to the rural districts of that province during the fiscal year will approximate $1,000,000, according to Premier Ferguson, who recently stated that three-quarters of this amount had been expended in making hydro service available to the farming communities of old Ontario. This expenditure is an increase of approximately $650,000 over last year's.

George Westinghouse Memorial Committee Appointed.—A committee chosen from among executives of the Westinghouse corporations has been named to represent the enterprises founded by George Westinghouse in the work of erecting a memorial to him in Schenley Park, Pittsburgh. The committee consists of A. L. Humphreys, E. M. Herr, F. A. Merrick and John F. Miller. The monument, in building which the Pittsburgh Chamber of Commerce is taking a leading part, will take the form of a half-oval. A back wall of bronze, 44 ft. long and 13 ft. high, will be erected on a granite base. In the center of the wall a medallion of Mr. Westinghouse in granite will be set, and on either side of the medallion will be figures representing the Genius of Enterprise and the Genius of Engineering. Wings of the half-ellipse will be divided into eight panels in which the inventor's achievements will be depicted in bas relief. The obverse of the bronze wall will bear plaques of the Westinghouse plants. The memorial will cost $200,000, it is estimated.

New York's Annual Electrical Show Opens.—The nineteenth annual electrical exposition in New York City was opened in the Grand Central Palace on Wednesday night, Oct. 20, and will continue through Saturday, Oct. 30. Twenty thousand electrical devices, large and small, are displayed, including fifteen different applications of electric refrigeration. A historical exhibit, a model kitchen, a complete electrical "beauty shop," an army display and the latest models of electric trucks are among the attractions.

Cleveland to Have Demonstration of Progress in Electrical Industry.—On Tuesday next, Oct. 26, two thousand business men will take part in a combined meeting and exhibition featuring the electrical industries of Greater Cleveland. A special survey is being made by the Chamber of Commerce and the Electrical League to show the extent of these industries and their growth. Thirty civic and business organizations are co-operating. There will be electrical demonstrations and a unique exhibit that will be representative of the entire industry, including power production as well as the manufacture of products which necessitate the use of power for their operation.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, July 3, page 50.]

Electric Power Club—(National Electrical Manufacturers' Association, Apparatus Division) — Briarcliff Lodge, Briarcliff Manor, N. Y., Oct. 25-28. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

National Safety Council — Detroit, Mich., Oct. 25-29. W. H. Cameron, 168 N. Michigan Ave., Chicago.

National Association of Railroad and Utilities Commissioners—Asheville, N. C., Nov. 9-12. J. B. Walker, 270 Madison Ave., New York.

American Engineering Council—Administrative board, Ithaca, N. Y., Nov. 11 and 12. L. W. Wallace, 26 Jackson Place, Washington, D. C.

American Institute of Electrical Engineers — Regional meeting, New York, Nov. 11-12. F. L. Hutchinson, 33 West 39th Street, New York.

National Electrical Credit Association—Philadelphia, Nov. 12; New York, Dec. 7; Boston, Jan. 18. F. P. Vose, 1008 Marquette Bldg., Chicago.

Empire State Gas and Electric Association — Electric Meter Section, Hotel Seneca, Rochester, Nov. 15 and 16. C. H. B. Chapin, Grand Central Terminal, New York.

American Welding Society — Buffalo, Nov. 16-19. M. M. Kelly, 29 West 39th Street, New York.

American Society of Agricultural Engineers, Farm Power and Machinery Division—Chicago, Dec. 1 and 2. Raymond Olney, St. Joseph, Mich.

American Society of Mechanical Engineers—New York, Dec. 6-9. C. W. Rice, 29 West 39th St., New York.

Northwest Association of Electrical Inspectors—Multnomah Hotel, Portland, Ore., Jan 18 and 19. F. D. Weber, Box 745, Portland.

A. E. C. Board Will Meet at Ithaca Next Month.—The administrative board of the American Engineering Council will meet at Ithaca, N. Y., Nov. 11 and 12. Reports will be received from numerous committees which have been active during the summer. Among the topics in the large agenda which is being prepared are safety and production, registration of engineers, government reorganization and jurisdictional strikes in the building industry. Dean Dexter S. Kimball of Cornell University, the president of the Council, will preside.

New York State Joins Fight Against Chicago Drainage Canal Diversion.—New York has been permitted by the Supreme Court to join Michigan in its complaint against Illinois and the Chicago Sanitary District growing out of the diversion of water from Lake Michigan. Wisconsin, Minnesota, Ohio, Indiana and Pennsylvania are complainants in another suit. By inclusion of the Empire State questions will be injected into the case of proprietary rights over the waters of the Niagara and St. Lawrence Rivers for the development of hydro-electric power.

Mexican Light & Power Company Has Big Development Plan. — One of the largest flood prevention, irrigation and hydro-electric enterprises yet undertaken in Mexico is embodied in a contract signed by the Mexican government and the Mexican Light & Power Company. The project calls for the construction of a concrete dam across the River Lerma, near Contepec, in the State of Michoacan. The dam will impound 500,000,000 cu.m. of water, which will be used in irrigating more than 50,000 hectares of agricultural land as well as furnishing power to a great hydro-electric plant. The cost is put at $8,000,000 in United States money. More than 200,000 hp. may be generated. The Mexican Light & Power Company is a Canadian corporation.

Benson Springs (Fla.) Plant Now Operating.—The Florida Public Service Company is distributing ten thousand copies of an attractive booklet to celebrate the company's new Benson Springs power station on Lake Monroe, opposite Sanford, which was put in operation recently, only seven months after construction began. An illustrated notice of this station was published in the ELECTRICAL WORLD for July 17, page 135. The booklet shows views of the company's electric power and lighting facilities and of natural attractions in the district it serves. The station is now furnishing 12,500 kw. Additional units are to be added.

Kinston (N. C.) Municipal Plant May Be Sold.—The City Council of Kinston, N. C., will receive bids this month from would-be purchasers of its municipal lighting plant, including, it is understood, the Carolina Power & Light Company. It is thought, however, that there is no likelihood of an immediate sale, for, although officials and business

men doubt the wisdom of the city's continuing to run the plant and think a better price could be had now than in the future, there is a strong sentiment for maintaining public ownership, and any plan of sale would have to be voted upon. The assessed valuation of the plant is $450,000, and last year's net revenue was put at $41,000 after marking off 10 per cent for depreciation.

Rate Reductions in Salem and Beverly, Mass. — A reduction of approximately 10 per cent in the average rate per kilowatt-hour has been announced by the Salem (Mass.) Electric Lighting Company and the Beverly (Mass.) Gas & Electric Company, two of the North Boston Lighting Properties group managed by Charles H. Tenney & Company, Boston. On Jan. 1 the maximum price will be reduced from 12 to 11.5 cents and on July 1, 1927, a further reduction to 11 cents will be made. These cuts will apply to household, short-term general lighting and commercial lighting service in both companies and also to auxiliary lighting service in Salem.

How Service Was Maintained at Beardstown, Ill., During Flood.—One of the Illinois cities that suffered most from the heavy floods in the first part of this month was Beardstown, where there was a record-breaking rise of the Illinois River to 25.7 ft., inundating almost the entire city. The Central Illinois Public Service Company was able to maintain its electric and gas service throughout the entire period of flood by building levees of sandbags around its plants, and the company reports that no damage whatever was suffered by it. The importance of this service to the community, where virtually every furnace had been put out of commission, in fighting cold and damp by the use of portable heaters was especially great.

N. E. L. A. Committee Meetings.—The various committees of the Accounting National Section, N. E. L. A., met at the Edgewater Beach Hotel, Chicago, on Oct. 20 and 21, a general meeting of the section being called for the latter day. The Commercial National Section committees are scheduled to meet at the same place as follows: Nov. 3—promotional rates, lighting service, competitive power, transportation, domestic electric range; Nov. 4—sales organization and management, home lighting, industrial lighting, industrial heating, water heating, merchandising, executive; Nov. 5—customer relations, wiring, street and highway lighting, commercial cooking, refrigeration. A general meeting and dinner of the section will be held on Nov. 4.

Chelan River Development Opposed.—An application by the Chelan Electric Company, which is a subsidiary of the Washington Water Power Company, for authority to condemn certain lands on the Chelan River in Washington in connection with the great hydro-electric plant it is to construct has been denied in the lower courts on the ground that only 15 per cent of the power to be generated would be for public use. The Supreme Court of the state will review the decision next month. The main object of the plant is to furnish the Great Northern Railway with power for the electrification of its lines through the Cascade Mountains. Progress already made on the work is recounted on page 873 this issue.

Gays Mills, Wis., Has New Hydro Plant.—The new hydro-electric plant of the Interstate Power Company at Gays Mills, Wis., is in service and will furnish power and light for five Kickapoo Valley towns. It replaces a small water-power plant that furnished energy only for Gays Mills. The new plant contains two small units and has an automatic device operated by a vacuum process which is said to increase the headwater of the dam about 25 per cent. Transmission lines are connected to the trunk lines of the Dubuque (Iowa) and Galena, (Ill.) plants and will feed all excess current to McGregor, Iowa, and Prairie du Chien and Lancaster, Wis. Construction of the plant was begun last December. In March part of the work was washed away by flood, but the cofferdams were saved with 40,000 sacks of sand.

An 8,000-Hp. Direct-Current Motor.—A direct-current motor rated at 8,000 hp., which the manufacturer says is the largest ever made, has just been shipped from the Westinghouse Electric & Manufacturing Company's plant at East Pittsburgh. This motor has a total weight of 625,000 lb. The over-all length of the shaft is 26 ft. 8 in. and the frame has an outside diameter of 20 ft. It is capable of developing 2,400,000 ft.-lb., which at 40 r.p.m. is equivalent to 18,300 hp. The motor obtains its power from a flywheel set which consists of two 3,500-kw., 700-volt generators operating at 375 r.p.m. Three 50,000-lb. flywheels are used to equalize peak loads. The set is driven by a 5,000-hp. induction motor, of which the over-all length is 48 ft. 8 in.

Vermont's Latest Hydro-Electric Development

RAPID progress is being made in building a 7,000-kw. hydro-electric development of the Green Mountain Power Company at Moily's Falls, about 16 miles above Montpelier, Vt., to supply energy to the system of the Montpelier & Barre Light & Power Company. Water will be delivered to a single generating unit drive by a penstock as shown (with a portion of a surge tank) in the illustration above, the operating head being 380 ft. An earth dam will impound the flow of a branch of the Winooski River at the headworks of the development, which is being built by Charles H. Tenney & Company, Boston, managers of the Montpelier property.

Electrometallurgical Plant at Chute-à-Caron Prophesied.—Construction in the near future at a cost of $12,000,000 of a huge hydro-metallurgic plant in the Lake St. John district of the Province of Quebec is said to be under serious consideration. This project, it is asserted, was conceived several years ago by the late James B. Duke, but was temporarily abandoned after his death. As virtually the complete electric power output of the Lake St. John district is now employed in other industries, it is believed that the realization of the new project will be witnessed immediately after the completion of the hydro-electric development at Chute-à-Caron. The proposed plant would be used as a zinc smelter and to refine metals of various kinds.

Small Georgia Hydro-Electric Plant Triumphs Over Obstacles. — The triumph of hydro-electric engineering over natural obstacles due to a remote situation and a treacherous subsoil has just been seen in the restoration to duty of the Baker County Power Company's plant on Nochaway Creek, Georgia, and the supply from it of power to Moultrie, Ga., which had been obtaining service from the South Georgia Power Company. The water-power site, 50 miles west of Moultrie, is far from a railroad, involving unusual transportation difficulties. The work has been in progress five years. The first dam, completed in 1923, was undermined and washed away in a few weeks, and one obstacle after another has been met in carrying through the work. The total capacity at present is only 2,400 hp., divided between four units, but if a load develops additional units will be added.

Rental of $50,000 a Year Offered for Municipal Hydro-Electric Site at Oswego, N. Y.—Floyd L. Carlisle has offered on behalf of the People's Gas & Electric Company of Oswego, N. Y., to take over under a 25-year lease the development of the municipal power site at Dam No. 6 in the Oswego River. The company offers to build a hydro-electric plant sufficient for the development of one-half of the surplus of the Oswego River at Dam No. 6. This plant, it is estimated by the city's consulting engineer, will cost $850,000. As rental the Carlisle company will pay in cash $50,000 annually for 25 years, or will reduce the company's lighting rates in Oswego by $50,000 annually, or will reduce the rates $25,000 annually and pay a like amount in cash. An amendment to the city charter will be necessary if the site is to be leased for more than ten years.

Men of the Industry

S. B. Hood Promoted to Consulting Position

S. B. Hood, for the past ten years distribution superintendent for the Minneapolis General Electric Company, a subsidiary of the Northern States Power Company, has been appointed consulting electrical engineer of the Northern States organization, with headquarters in the main office of the company at Minneapolis. His duties will consist of a general advisory supervision over all electrical activities and to work out, in co-operation with the engineers of the Byllesby Engineering & Management Corporation, managers for this property, a comprehensive coordinated plan of development designed to fit the expected continued future growth of the system over a number of years. Mr. Hood is well known in the industry through the many new developments he has successfully worked out for distribution systems, having been engaged in this line of work for more than thirty years.

M. C. Miller, formerly distribution engineer under Mr. Hood, goes with him as an assistant electrical engineer, giving him a much broader scope for the application of his initiative and ability as shown in his former position. **D. M. Bunn**, traveling distribution engineer for the company, assumes Mr. Hood's former duties in addition to retaining his own. These changes in engineering personnel have been made in order to meet the needs of a comprehensive plan of development in transmission and distribution.

Gerard Swope, president of the General Electric Company, has been elected a member of the executive committee of the corporation of the Massachusetts Institute of Technology, succeeding Frederick P. Fish.

Philip Kuehn, commercial manager of the Madison Gas & Electric Company, with which he has been connected for 20 years, has resigned to join forces with the Wisconsin-Minnesota Gas & Electric Appliance Company of Minneapolis, where he will be connected with the sales department. **Edward Felber**, long connected with the operating department of the Madison Gas & Electric Company, has been selected to succeed Mr. Kuehn.

J. G. Nelins, who for the past year has been manager of the Gainesville district of the Georgia Railway & Power Company, has been transferred to the Rome district as superintendent.

Surendra Nath Bose, for many years identified with the J. G. White Engineering Corporation, is now assistant chief electrical engineer with the Tata Iron & Steel Company, Ltd., Jamshedpur, India. A native of Allahabad, India, Mr. Bose received his technical training at the Allahabad University, India; the Technical Institute, Bombay, and Cornell University, Ithaca, N. Y. During his professional career in the United States, which covered a period of sixteen years, he was affiliated with the General Electric Company, the Pennsylvania Railroad Company and the Cazenovia (N. Y.) Electric Company; with C. P. Perin and S. M. Marshall, consulting engineers of New York, and with the J. G. White Engineering Corporation. His work included many phases of electrical engineering, including design, construction, tests, inspection and investigation. Mr. Bose is a member of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and the Association of Iron and Steel Electrical Engineers.

John Fritz Medal Awarded to Elmer A. Sperry

Elmer Ambrose Sperry, engineer, inventor and president of the Sperry Gyroscope Company, New York, has been made the recipient of the John Fritz gold medal for 1927 for the development of the gyro-compass and the

E. A. SPERRY

application of the gyroscope to the stabilization of ships and aëroplanes. This annual award was made unanimously Oct. 15 by the board of sixteen representatives of the American societies of electrical, mechanical, civil and mining and metallurgical engineers.

Mr. Sperry has for many years been a prominent figure in electrical engineering circles, having been one of the founders of the American Institute of Electrical Engineers and of the American Electrochemical Society and chairman of the committee that called the first meeting of the National Electric Light Association.

In 1880 he founded the Sperry Electric Company of Chicago and manufactured arc lamps, dynamos, motors and other electric appliances. In 1883 he erected on Lake Michigan the highest electric beacon then known—about 350 ft.—and equipped it with 40,000 cp. of arc lights. In 1888 he won the distinction of having been the first to produce electrical mining machinery. Soon after his first successes in mining machinery he founded the Sperry Electric Railway Company of Cleveland, to manufacture railway cars, and continued with success until 1884, when the patents were purchased by the General Electric Company.

About thirty years ago Mr. Sperry turned his attention to the gyroscope, and the result was his invention of the first successful gyro-compass. It was in 1910 that he organized the Sperry Gyroscope Company to manufacture the gyro-compass, ship and airplane stabilizers, highest-intensity searchlamp, fire-control apparatus, airplane and navigational equipment, etc.

Mr. Sperry is the holder of more than four hundred patents on mechanical and electrical devices and the author of many addresses and papers before engineering and technical societies. In addition to his affiliation with the associations already mentioned he is a member of the American Society of Mechanical Engineers, the American Chemical Society, the Society of Automotive Engineers and many other similar organizations. The presentation of the medal will take place Tuesday evening, Dec. 7, in the Engineering Auditorium, New York, in connection with the annual meeting of the American Society of Mechanical Engineers.

Carl Eck, formerly district manager of the Central Power Company at Hastings, Neb., has been appointed district sales manager with headquarters at Grand Island.

S. M. Cox, for the past year assistant division manager of the Illinois Power & Light Company in Galesburg, Ill., has been appointed district manager of that utility in Kewanee.

Fred C. Wilson has been appointed superintendent of the new district which the Georgia Railway & Power Company has recently established at McDonough.

A. A. Meyer, assistant general superintendent of the Detroit Edison Company, has recently been transferred to the research department of that company.

R. E. Duffy of Greenfield, Mo., has been appointed to succeed **L. W. Helmreich** in charge of the Missouri State Public Service Commission's division of light, water, gas, heat and electric rates. Mr. Helmreich has become manager of the City Water Company of Jefferson City, Mo.

C. A. Winder, who has been consulting engineer for the city of Fort Worth, Tex., since last spring, has been appointed supervisor of public utilities, an office just created by the City Council of Fort Worth. Mr. Winder previously had been connected with the General Electric Company for fifteen years, having been stationed at El Paso, Tex., Phoenix, Ariz., and Niagara Falls, N. Y., as local manager of these offices, and at Schenectady as department sales manager of the industrial heating department.

C. E. Collins and **John W. O'Connell** have been appointed district managers of the Western United Gas & Electric Company, Aurora, Ill., according to an announcement made by W. M. Willett, general manager. Mr. Collins, has been manager of the gas division of the utilities in the Elgin and McHenry districts since 1920 and becomes district manager of both electric and gas departments in that territory. Mr. O'Connell, manager of the light division in the Elgin district, will be manager of the

electric light and power, gas and steam-heat departments of the Aurora district, succeeding **Charles Tennant**, who has been appointed director of public relations for the company. **E. E. Lungren** of Aurora becomes assistant general manager.

J. P. Freeman, formerly of Sydney, Nova Scotia, has joined the engineering staff of the Abitibi Power & Paper Company, Iroquois Falls, Ontario.

R. R. Walbridge, who has been district manager of the Southern California Edison Company at Porterville, has been transferred to the same position in the Santa Barbara district. **A. W. Frost**, assistant district manager at Alhambra, has been made district manager of Porterville to succeed Mr. Walbridge.

F. R. Ryan, formerly president and manager of the Morgan (Utah) Electric Light & Power Company, is the new owner of the North Branch (Mich.) Electric Works, previously owned by R. G. Green. Mr. Ryan sold the Morgan plant a year ago to the Western States Utilities Company, a subsidiary of the General Power & Light Company, Chicago.

Lee Gravette, who has been connected with the electric department of the Oklahoma Gas & Electric Company at Enid for the past two years, has resigned to join the Petroleum Electric Company of Tulsa.

H. Chester Gause, formerly connected with the engineering department of the Alabama Power Company at Montgomery, has been transferred to the power sales division of the commercial department in Birmingham.

Paul H. Darr, for several years manager for the Public Service Company of Oklahoma in the Atoka district, has been transferred to Chickasha, where he will assist F. D. Shaffer in the development of the expansion program which Mr. Shaffer has under way in that territory. Mr. Darr has had several years' experience in handling high-tension transmission distribution, and the rapid development of this phase of the business in the Chickasha territory makes it necessary for Mr. Shaffer to add to his personnel.

Major James R. Werth of Lynchburg, Va., has joined the New York sales organization of the American Brown Boveri Electric Corporation and has been placed in charge of sales to holding companies, with headquarters in New York. Previously Major Werth was superintendent of the Lynchburg Traction & Light Company at Lynchburg, Va., and prior to that connection he was with the H. M. Byllesby Company, the West Penn Power Company, and for some time was in charge of power-plant construction in the construction division of the army. During the years 1906 to 1917 Major Werth was in the employ of the General Electric Company.

Dr. Samuel Stuart Mackeown, an authority on the design of high-power vacuum tubes and their use, has been appointed assistant professor of electrical engineering at the California Institute of Technology, Pasadena. Dr. Mackeown joins the Institute after an association with the vacuum-tube research department of the Westinghouse Electric & Manufacturing Company in New York, where he has been working on the development of high-power vacuum tubes. After receiving his doctor's degree at Cornell University he was a national research fellow for three years at the California Institute, where he worked in co-operation with Dr. Millikan on problems relating to the detachment of electrons from cold metals.

W. Fossen, who has been associated for many years with the main offices of the Northern States Power Company at Eau Claire, has been selected to manage the company's properties at Ellsworth, succeeding the late George Headrick.

Obituary

Richard E. Breed

Richard E. Breed, a leading figure in the field of public utility operation, died Oct. 14 in Roosevelt Hospital, New York, as the result of a toxic infection following an operation. Mr. Breed was born in Pittsburgh in 1866 and removed to New York 20 years ago. He organized the American Gas & Electric Company and at the time of his death was serving as chairman of the board of directors. He was in addition a member of the board of directors of the American Power & Light Company, the Electric Power & Light Corporation, the Carolina Power & Light Company and many other industrial corporations. In commenting on the death of Mr. Breed, Anson W. Burchard, a vice-president of the General Electric Company, said: "In the passing of General R. E. Breed the electric light and power industry has been deprived of an influence of the highest potentiality in the promotion of constructive development. General Breed was possessed of that breadth of vision which inspires great achievement, while his character and personality gained the confidence of those with whom he came into contact and enabled him to exercise the influence necessary for the accomplishment of progress on a large scale in the enterprises with which he was connected."

Dr. William Sturgis Bigelow, vice-president of the Massachusetts Institute of Technology in the early days of its history, died recently at Boston.

Robert H. Atkinson, manager of the merchandising division of the Atlanta district of the Westinghouse Electric & Manufacturing Company, died suddenly at his home in Atlanta Oct. 11. Mr. Atkinson, who had been connected with the Westinghouse company for the past four years, was 32 years of age.

George Headrick, who was manager of the Northern States Power Company's properties at Ellsworth, Wis., where he had lived for several years, died recently at his home. Mr. Headrick was retained as manager of the company's Ellsworth properties when it purchased the Wisconsin-Minnesota Light & Power Company a few years ago.

Christian Langenfeld, for many years connected with the Siemens and Schuckert interests, died recently in Nuremburg, Germany, at the age of 72. Herr Langenfeld became connected with the Schuckert electrical engineering concern in 1884 and established and managed for many years that company's department connected with the drawing up of electric lighting and tramway projects. He was responsible for plants not only in Germany, but also in Norway, Hungary, Italy and Belgium. On the amalgamation of the Siemens and Schuckert interests he was appointed manager of the branch in Nuremburg, a position which he held until he retired in 1917.

Frank W. Remick, a partner in the banking house of Kidder, Peabody & Company, Boston, formerly president of the Boston Stock Exchange, and a director of the Mississippi River Power Company, the Puget Sound Electric Railway, Puget Sound Light & Power Company and many other corporations, died at Boston Oct. 16.

James C. Galbraith, who had been connected with the Re Qua Electric Supply Company of Rochester, N. Y., died at the Strong Memorial Hospital in that city Oct. 14. In tribute to Mr. Galbraith, the Re Qua Electric Supply Company was closed during the funeral.

George E. Teel, for many years office manager of the Salem (Mass.) Electric Lighting Company, died at his home on Oct. 12, after several weeks' illness. Mr. Teel was born at Salem in 1868 and had been in the employ of the company for 38 years. He was highly regarded in the Tenney organization.

Charles H. Peirson, assistant vice-president of the Southern California Edison Company, Los Angeles, died Oct. 19 after an illness of two days. Though a native of Batavia, N. Y., Mr. Peirson had lived in California since 1900 and had been affiliated with the Edison company since 1909. While in the East he obtained wide experience in editorial and executive positions in the general offices of the Associated Press in New York City and with newspapers elsewhere. During his association with the Southern California Edison Company he had directed its publicity work, as advertising agent, supervisor of public information, and since last spring as assistant vice-president.

Edward N. Lake, consulting engineer, died Oct. 15 at his home in Wheaton, Ill. At the time of his death Mr. Lake was general manager of the Chicago Engineering Associates, a firm of electrical and mechanical engineers, which in association with James N. Hatch he organized after service in the World War. Some of Mr. Lake's earlier connections had been with the Commonwealth Edison Company as a construction engineer on the Fisk Street station and with the Board of Supervising Engineers of Chicago. In this last-mentioned connection Mr. Lake made some of the earliest and most exhaustive investigations on electrolysis, and many of the methods he originated for the study of this problem are still in use. Mr. Lake was a fellow of the American Institute of Electrical Engineers and a member of the American Society of Civil Engineers, the Western Society of Engineers and other clubs.

Commission Rulings

Conveying Information on Bills Covering Company's Service Recommended.—Commending the Billings Gas Company for its trouble service, the Montana Public Service Commission said: "The company has from time to time publicly advertised its trouble service and invited inquiry from its customers. We think that a more effective method of reaching the subject would be to print upon the monthly bills an informative statement as to the existence of the trouble service division and an invitation to customers to make free use of it whenever necessary."

Percentage Payment to Construction Company Controlled by Utility Employing It Disapproved. — The Tennessee Railroad and Public Utilities Commission has disapproved, as an item in valuation, of the payment by the Tennessee Eastern Electric Company of a percentage of the cost of constructing additions to a construction company organized at the expense of the utility company and controlled by the same stock-holding interests. This company, the commission found, assumed no risk, furnished no service and paid for no material for which it was not reimbursed by the electric company except as regarded the salaries of its general officers, who were also, with one exception, officers of the utility. The exception was a construction company vice-president, and the commission found his services of value and approved the inclusion in the utility company's rate base of the agreed-upon salary and percentage of profits accruing to him.

Municipal Plants Must Not Accumulate a Surplus for Transfer to General Fund.—Substantial reductions in rates for the municipally owned electric light plants at Anderson and Logansport, Ind., have been ordered by the Public Service Commission of that state. In these orders the commission took a definite stand to the effect that municipally operated light plants should not by means of high rates create surpluses which can be transferred to the city's general fund for the benefit of taxpayers. "Creating a surplus should be stopped, and this commission will not knowingly authorize a rate that will permit such practice," the order in the Anderson case read. "The commission suggests that the time has come for the city officials to make tax levies sufficient to care for all municipal purposes." The Anderson reduction in electric lighting rates will amount to about 20 per cent. The rate to domestic users was reduced from 6.48 cents to 5.18 cents a kilowatt-hour.

Disapproves Ordinance to Prevent Competition When Such Ordinance Surrenders Municipal Rights.—The New Jersey Board of Public Utility Commissioners disapproved the passage by the municipality of Long Branch of an ordinance binding the city not to lay duplicate mains during the existence of a franchise granted to a sewer company. The board said: "The policy of the state to prevent unnecessary duplications of the facilities of public utilities and uneconomic competition, injurious eventually to the public interest, does not find expression in legislation authorizing governing bodies of municipalities to bind themselves and their successors not to exercise for a term of years powers bestowed upon them by law. It seems to us that it is the state policy to permit municipalities to grant within their discretion franchises to public utilities, with authority given to the Board of Public Utility Commissioners to determine, if and when the question arises, whether a franchise which may result in competition should become effective. The fact that it is not the policy of the board to approve competition with an existing utility furnishing safe, adequate and proper service is ample evidence that a utility furnishing such service has no reason to fear approval of franchises which would lead to unfair and wasteful competition."

Recent Court Decisions

Sale of Utility to City Did Not Prevent Commission from Changing Rate.—In Town of Wiley vs. City of Lamar the court of first instance found that Lamar, which had acquired from a private company the electric light and power plant supplying the city, could not under the Colorado law increase contract rates to Wiley, despite sanction from the Public Utilities Commission to do so. This decision has been reversed by the Supreme Court of Colorado, which finds that where a municipal plant supplies service to consumers outside its territorial boundaries the power to fix rates resides in the commission and that, since the public utility statute was to be read into the contract between the private corporation and the town of Wiley, the sale of the plant to the city of Lamar did not prevent the commission from fixing the rate. (248 Pac. 1009.)*

Merger of Steam-Operated Electric Light and Power Companies with Hydro-Electric Companies.—The Supreme Court of Pennsylvania has ruled that under the law of that state a steam-operated electric light and power company and a hydro-electric company are engaged in the same or a similar line of business and may merge. The question was raised in New Haven Water & Power Company and Metropolitan Edison Company vs. Pennsylvania Public Service Commission, the commission having held that these companies could not legally unite. A lower court upheld the decision; but the Supreme Court has overthrown it, insisting only that the New Haven company surrender its right to supply water to the public, which right had not been exercised. The Supreme Court said in part: "The question raised by this appeal is of considerable importance. It concerns the right of an electric light, heat and power company to purchase or merge with a hydro-electric or water-power company. Both are public service concerns, owing duties to the public. The tendency of the day is to consolidate the former companies and construct, if possible, hydro plants for supplemental energy. This result prevents great economic waste and makes possible more efficient service at reduced rates to the public. The part which the hydro plants play in this system is doubly important, since it not only effects a saving to the consumer, but is an actual conservation of our mineral resources, a matter of the utmost importance to the commonwealth. These considerations make the consolidation or merger of these plants a matter of public policy, which should be accelerated by a liberal construction of the acts empowering merger or purchase. . . . Having thus considered the principles, we will apply them to the facts in this case. The vendee is incorporated for the purpose of supplying light, heat and power by means of electricity. Vendor was originally incorporated for the purpose of supplying water and water power. By an amendment the right was given to develop electric power for commercial purposes. This amendment may be treated as though it were written into the original charter, and the incorporation would then be for the purpose of supplying water and water power and developing electric power by means of water power. As a matter of fact, both companies are engaged in the manufacture and production of electricity. It will be seen from an inspection of their charters that they have certain powers in common, and under these powers they are transacting the same or similar business. But, as correctly observed by the Superior Court, the right to furnish water to the public is not common to both companies. Appellant says that it has made no use of that power and that it has not engaged in the business of supplying water to the public. . . . Though the sale of such property as here proposed may pass only such franchises as are consistent with the purchasing company, this charter right would be outstanding. It is clearly inconsistent with the business done, but is not fatal to consolidation. A sale or merger cannot take place until the company legally discards the offending power. It must be legally declared dead in the manner provided by law. Until that takes place proceedings should be held in abeyance, or refusal in case the company declines to take the step." On another point the court said: "Our water power is not consistent throughout the year. Each hydro plant must be supplemented by steam. The main purpose of both is to manufacture electric current. They cannot, under the guise of acquiring a property for the purpose of generating electricity by water power, extend, through steam construction out of proportion to the water power it supplements, their electric current generated by these steam facilities into districts not covered by their own charter." (134 At. 419.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Financial and Corporate

Utility Markets Lower

Common Issues Move Downward in Sympathy with General Market, While Preferred Hold Firm

FURTHER erratic movements in the stock markets during the week have not made it any easier to arrive at a decision with regard to the probable outcome. Promises of recovery have each time ended in reaction, with the net change favoring the bear interests. Aside from internal market factors a decidedly bearish influence was exerted by the bankers' manifesto demanding tariff reductions on a wholesale scale. Such factors as money rates have little visible effect on the situation. While the official call rate remained at 4½, cheaper outside money is apparently available, and there is no immediate indication of permanently higher rates.

Many of the more active public utility issues have tended to follow the zigzag movements of the big market. On the whole, however, preferred issues have held relatively firm, and some gains were reported. West Virginia Utilities gained 1½ points.

Among the common issues there was a more definite break in sympathy with the large markets. Losses were registered by United Light & Power, which eased to 10⅝, and Lehigh Power. The ELECTRICAL WORLD index of twenty public utility common stocks eased one more point to 88, against 90 at the beginning of the month. Nine of the stocks remained unchanged, seven registered gains and four showed losses. Generally speaking, the market would be termed inactive.

The bond market has remained at approximately the same level for a considerable period. The leading new issue this week was that of the New Hampshire Public Service, which was sold at 95, representing a yield basis of 6.32 per cent.

Dame Silences Rumors About North American Company

When asked this week about the prospects of a change in the dividend policy of the North American Company, Frank L. Dame, president, said: "I have heard two rumors within the past few days—one that we would pass the dividend entirely and the other that we would pay in cash instead of stock. We have been unable to trace their origin, but there is no truth in them and the subject has not been discussed even by the officers of the company. A conservative stock-dividend policy is admirably adapted to the electric light and power business. The operating companies must keep pace with the growth of the communities they serve in order to retain exclusive rights in their territories. Past records show that the electric light and power business has doubled on the average approximately in periods of five years. I see no reason why this should not continue on account of the many new applications in the use of electricity for both domestic and commercial purposes. In a company such as ours about 50 per cent of the financing should be done by bonds of subsidiaries, perhaps one-half of the balance by subsidiary preferred stocks sold locally, but, unless the holding company makes additional investments in the common stock to keep a balanced capital structure, the credit of the subsidiary companies will be impaired. Our dividend policy provides a substantial part of the money needed for this purpose.

"In addition to these rumors there has been one which has been repeated many times by certain newspapers and tipster sheets to the effect that the North American Company is going to be the particular target of the forthcoming Ripley article in the *Atlantic Monthly*. These rumors are causing our 35,000 stockholders a great deal of concern, but, while I have not seen the article, I am glad to be in a position to say that I am assured that there is no criticism of the North American Company in it."

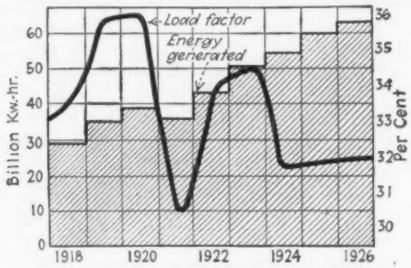
Capital Turnover on the Wane

Growth of Revenue in Light and Power Industry Since 1923 Has Not Been Commensurate with Rise in Capital Invested—Law of Diminishing Returns Operative

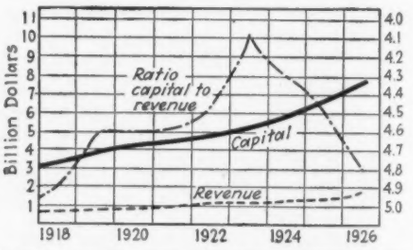
BY H. M. CAMERON
Financial Editor of the ELECTRICAL WORLD

SOMETHING strikingly similar to what the economist calls the "law of diminishing returns" has commenced to operate in the light and power industry. For the past three years revenue growth has not been commensurate with the rise in the volume of capital invested.

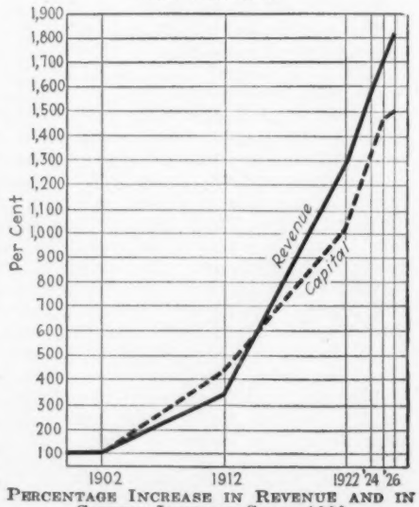
For more than a decade these utilities had a singularly creditable earning record. Gross revenues expanded at an enormous rate. With such a background the industry attracted abundant capital with little effort. Today the industries concerned must see to it that this shall continue. Should we suddenly pass into an era of depressed business, say in 1927, as many predict, capital



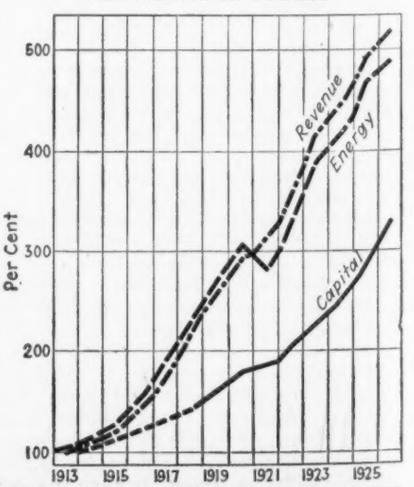
TOTAL ENERGY GENERATED HAS GROWN STEADILY, BUT LOAD FACTOR HAS DECLINED



THE RATIO BETWEEN CAPITAL INVESTED AND REVENUE OF ELECTRIC LIGHT & POWER COMPANIES IS ON DECLINE



PERCENTAGE INCREASE IN REVENUE AND IN CAPITAL INVESTED SINCE 1900



FROM 1913 TO 1923 REVENUE INCREASED MORE RAPIDLY THAN CAPITAL

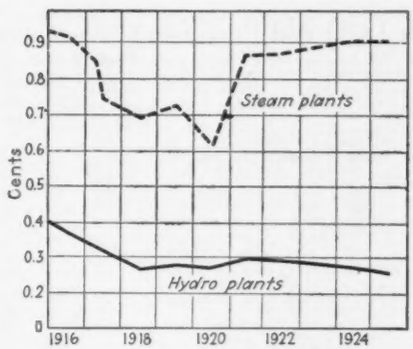
might become much more critical. The power and light industries would be asked to show why a dollar invested today does not yield so large a return as a dollar invested three or four years ago.

From the beginning of the century to about 1914 capital grew more rapidly, on a percentage basis, than revenue. New and more extensive equipment was being added to replace obsolete machinery, and relative returns were not immediately shown. About 1915 cumulative returns from these industries began to register and a relatively larger income was realized. In addition the war increased the capacity factor and savings in losses were being effected in generation, transmission and distribution. The areas served were still largely local and heavily loaded, although the market was growing wider. Such was the background of the industries until three years ago.

RELATION BETWEEN CAPITAL AND REVENUE
(000 omitted)

Year	Investment	Revenue	Ratio
1918	$3,245,185	$664,850	4.9 to 1
1919	3,600,000	773,650	4.6 to 1
1920	4,100,000	882,750	4.6 to 1
1921	4,400,000	944,400	4.6 to 1
1922	4,800,000	1,072,120	4.5 to 1
1923	5,200,000	1,265,550	4.1 to 1
1924	5,800,000	1,354,570	4.3 to 1
1925	6,600,000	1,470,000	4.5 to 1
1926*	7,500,000	1,570,000	4.8 to 1

*Estimated on basis of first half-year.



NET EARNINGS PER KILOWATT-HOUR IN STEAM AND HYDRO PLANTS

About 1923 the capital line began to rise more rapidly than the revenue line. Investments began to turn over less rapidly. In 1923 capital had been turning at the rate of once in four years, or revenue was one-quarter of capital invested, but the decline which set in at that time has continued up to the present, when capital is turning at the much slower rate of once in approximately five years.

An analysis of the present earning ratio discloses a rather serious situation. At precisely the same time as the ratio between capital and revenue began to change a falling off became evident in the capacity factor of these industries. There are various reasons for this. Some utilities have been adding larger generating capacity than is now required to take care of the indicated market growth. In other cases interconnected lines and large transmission systems were built in anticipation of future loads. The added costs are not immediately covered by correspondingly greater revenues. Furthermore, all equipment prices are at a high level and labor cost has become very great. This increases capitalization and lowers revenue because of expanding operating costs. In some cases the building of lightly loaded interconnected lines in the hope of effecting future economies in operation has been a factor. Large new stations have been built, which, assuming that capital investment is carried on at approximately the same rate as before and old plants are still available, would produce a margin of unused capacity and increased investment per unit of revenue. Moreover, the change from direct to alternating current involves

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Oct. 19	Low 1926	High 1926
ABITIBI PWR. & PAPER, com. —no par	89	70¼	98
Adirondack Pwr. & Lt.—7% pf.	103	....	....
Adirondack Pwr. & Lt.—8% pf.	113	....	....
Ala. Pwr., pf.	105½	....	....
Allis-Chalmers Mfg. pf.	k109	105	110½
Allis-Chalmers Mfg., com.	87	78¼	94¼
Aluminum Co. of Amer., com.	70	....	....
Aluminum Co. of Amer. pf.	101½	96½	102½
Amer. & Foreign Pwr., pf. 25% pd.	m110	....	....
Amer. & Foreign Pwr., 7% pf.—no par	86½	79	98
Amer. & Foreign Pwr., com.—no par	16½	14¼	42¼
Amer. Bosch Magneto, com—no par	19½	16	34½
Amer. Brown, Boveri, Elec.	39½	30½	50
Amer. Brown, Boveri, Elec., pf.	k 96	86½	96
Amer. Elec. pwr, pf.	m111	102	111
Amer. Gas & Elec., 6% pf.—no par.	96	90½	96
Amer. Gas & Elec., com.—no par.	102	64	110½
Amer. Lt. & Trac., 6% pf.	108	105	115½
Amer. Lt. & Trac., com.	k208½	195	264
Amer. Pwr. & Lt., 6% pf.	97½	92	99½
Amer. Pwr. & Lt., com.—no par.	m 66½	50¼	72
Amer. Pub. Serv., 7% pf.	97½	92	99
Amer. Pub. Serv. com.	50	45	80
Amer. Pub. Utilities, 6% pf.	80	....	....
Amer. Pub. Utilities, 7% pf.	92	....	....
Amer. Pub. Utilities, com.	70	....	....
Amer. States Sec., A	2½	....	....
Amer. States Sec. B	2½	....	....
Amer. Superpwr., pf.—25	26½	23	26½
Amer. Superpower, pf.	95	....	....
Amer. Superpwr., Class A—no par.	27	19½	37½
Amer. Superpwr., Class B—no par.	29	21½	39
Amer. Wtr. Wks. & Elec., 7% pf.	k103½	101	108½
Amer. Wtr Wks. & Elec., com.—20.	51½	43½	74
Anaconda Copper	47½	41½	51½
Appalachian Pwr., 7% pf.	98	90	101
Appalachian Pwr., 2d pf., 7%	98	99	102
Appalachian Pwr., com.	78	78	83
Arizona Pwr., 7% pf.	59	....	....
Arkansas Cent. Pwr., pf., $7—no par	k104	99	107
Arkansas Lt. & Pwr., 7% pf.	102	....	....
Arkansas Lt. & Pwr., com.	102	110	115
Asheville Pwr. & Lt., 7% pf.	f106½	100½	107½
Assoc. G. & E., pf.—$3.50—50	50	....	....
Assoc. Gas & Elec., pf.—$6—no par	83	....	....
Assoc. Gas & Elec., Class A—no par	35½	25½	38¼
BABCOCK & WILCOX, com.	115	....	....
Binghamton Lt., Ht. & Pwr., pf.	90	92	95
Birmingham Elec. pf.—$7—no par.	105	....	....
Blackstone Valley Gas & Elec., pf.	103	103	106
Blackstone Valley G.&E., com.—50.	k100½	....	....
Blaw-Knox, com.	k 75	45	80
Brazilian Trac., Lt. & Pwr., com.	f106	....	....
Broad River Pwr., pf.	94	....	....
Brooklyn Edison, com.	154½	133	163
Buffalo, Niagara&East.Pwr.,pf.—25.	24¼	....	....
Buffalo, Niagara & Eastern Pwr., com.—no par	30½	....	....
CALIFORNIA ELEC. GENERATING, pf.	93	89	95
California Ry. & Pwr., pf.	120	88	130
Carolina Pwr. & Lt., pf.—$7—no par	107	....	....
Cent. & S. W. Ut. 7% pf.—no par	a 92	89½	96½
Cent. & S. W. Ut., pr. In. pf.—no par	m 99	93	100
Central Ariz. Lt. & Pwr., pf.	104	....	....
Central Ark. Ry. & Lt., 7% pf.	100	....	....
Central Ill. Pub. Serv., 6% pf.	a 89	87	91
Central Ind. Pwr., 7% pf.	87	85	93½
Central Pwr. & Lt., pf.	101	....	....
Central States Elec., 7% pf.	91	....	....
Central States Elec., com.	m200	200	230
Century Elec., com.	m115	110	116
Chicago Fuse Mfg., com., no par.	a 30	30	35
Cincinnati Gas & Elec., com.	g 90	88	95
Cities Service, 6% pf.	i 89½	86½	89½
Cities Service, pf.B—10.	i 7½	7¼	7½
Cities Service, pf. BB—100.	i 79	74	79
Cities Service, com.—20.	i 45½	37½	45½
Cities Service, Bks. Shrs.—10.	i 22½	19½	22½
Clarion River Pwr., pf.	95	93	95
Cleveland Elec. Illg., 6% pf.	107½	....	....
Cleveland Elec., Illg., com.	295	....	....
Colorado Pwr., 7% pf.	k 95	96	97
Columbia Gas & Elec., 7% pf.	114½	111½	115½
Columbia Gas & E. com.—no par.	83½	63½	90
Columbia Ry., Gas & Elec., 6% pf.	90	65	96
Columbus Elec. & Pwr., 2d pf.	104	....	....
Columbus Elec. & Pwr., com.	260	....	....
Columbus Ry., Pwr. & Lt., 1st pf.	98½	....	....
Columbus Ry., Pwr. & Lt., pf. B.	93	....	....
Col. Ry., Pwr. & Lt., com.—no par.	70	....	....
Commonwealth Edison, com.	a137½	135½	145
Commonwealth Pwr., 6% pf.	89½	82	91
Commonwealth Pwr., com—no par.	39½	28¼	48¾
Conn. Lt. & Pwr., 8% pf.	117	....	....
Conn. Lt. & Pwr., 7% pf.	108	....	....
Cons. Gas of N. Y., pf.—50.	58	....	....
Cons. Gas of N.Y., com.—no par.	107½	87	115½
Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf.	e105	102	107½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 6½% pf.	e110½	108½	111½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 7% pf.	e112½	109	113½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 8% pf.	e126½	124	128½
Cons. Gas, Elec. Lt. & Pwr. of Balti. com.—no par	e 52	45	57½
Cons. Pwr. & Lt., 7% pf.	105	....	....
Consumers Pwr., 6% pf.	98	....	....
Consumers Pwr., 6.6% pf.	104	....	....
Continental Gas & Elec., 7% pte. pf	100	....	....
Continental Gas & Elec., 7% pr. pf.	97½	....	....
Continental G.&E., com.—no par.	150	....	....
Crocker Wheeler, com.	20	....	....
Crocker Wheeler, pf.	57	....	....
DALLAS PWR. & LT., 7% pf.	108¼	....	....
Dayton Pwr. & Lt., 6% pf.	100	....	....
Detroit Edison, com.	138½	123½	141½
Dubilier Condenser & Rado, com.—no par	k 4½	4½	11
Dubuque Elec., 6% pf.	94	93	98½
Duquesne Lt., 7% pf.	115	111½	116½
EAST. N. Y. UTIL. pf.	102	80	104
Eastern New York Util., com.	65	70	75
Eastern States Power	13	....	....
Eastern States Power, pf.	89	....	....
Eastern Tex. Elec., 7% pf.	105	....	....
East. Tex. Elec., com.—no par.	75	70	80
Edison Elec. Illum. of Boston, com.	d224	207	250
E. Paso Elec., com.—no par.	70	70	94
E. Paso Elec. pf.	103	....	....
Elec. Bond & Share, 6% pf.	f106½	103½	109½
E. Bd. & Share Sec., com.—no par.	i 65½	56½	86
El. Household Util.	a 13	12½	25
Elec. Investors, 6% pf.—no par.	91	....	....
Elec. Investors, com.—no par.	37½	30½	74½
Elec. Investors, 10% pd. receipts.	25	12	56
Elec. Pwr. & Lt., ctfs. pf.	k 94	89½	98½
Elec. Pwr. & Lt., ctfs., 40% pd.	k102	99	115
Elec. Pwr. & Lt., ctfs. full pd.	k102½	102	110½
Elec. Pwr. & Lt., ctfs., com—no par.	16½	15¾	34½
Elec. Refrig.	48½	45½	78½
Elec. Ry. Securities, com.—no par.	k 5½	4½	10
Elec. Storage Battery, com.—no par.	84½	71½	94½
Elmira Wtr., Lt. & R. R., 7% pf.	98½	97½	99½
Emerson Elec., pf.	m101	100	104½
Empire Dist. Elec., 6% pf.	i 88	82	88
Empire Power, A.	26	....	....
Engr. Pub. Serv., pf.—no par.	93½	93½	96½
Engr. Pub. Serv., com.—no par.	m 20	20	24½
Eureka Vac. Cleaner, com.—no par.	k152	43	56
FAIRBANKS MORSE, pf.	k108	108	115
Fairbanks Morse, com.—no par.	43½	41½	59½
Federal Lt. & Trac., com.	31½	28	39½
Federal Light & Traction, pf.	k 88	86	91½
Federal Utilities, pf.	m 70	....	....
Federal Utilities, com.	m 17	....	....
Ft. Worth Pwr. & Lt., 7% pf.	f107	105	108½
GALVESTON-HOUSTON ELEC., 6% pf.	63	42½	63
Galveston-Hstn. El., com.	22	....	....
Gen. Elec., com.	83½	79	95½
Gen. Elec., special—10.	11½	11	11½
Gen. G.&E., (Del.) com. A no par.	42	34	59
Gen. G.&E., (Del.) com. B no par.	m 38½	38½	48½
Gen. G.&E., (Del.) A pf. $8 no par.	k109	105½	113
Gen. G.&E., (Del.) A pf. $7 no par.	k 98½	95	99½
Gen. G.&E., (Del.) pf. B.	k 93	92½	96
General Public Service, pf.	m103	100	106
General Public Service, com.	m 12	12	16½
Ga. Lt., Pwr. & Rys., 6% pf.	93	82	98
Ga. Lt., Pwr. & Rys., com.	m 70	65	80
Ga. Ry. & Power, 8% pf.	k114	112	114
Ga. Ry. & Power, 7% pf.	106½	....	....
Ga. Ry. & Pwr., 4% pf.	120	105	145
Ga. Ry. & Pwr., com.	120	....	....
Gt. Western Pwr., 7% pf.	h102	....	....
IDAHO PWR., 7% pf.	103	....	....
Ill. No. Utilities, 6% pf.	a 92½	90	92½
Ill. Pwr. & Lt., 7% pf.	98	....	....
Ingersoll Rand	92	80½	105
Int. Combus. Engr., com.—no par	40	33½	64½
Int. Utilities, class A—no par.	k 30	25	39
Int. Utilities, class B—no par.	4½	3½	9½
Interstate Pwr., pf., no par.	92	....	....
Interstate Pub. Serv., 7% pf.	96	96½	99
Iowa Ry. & Lt., 7% pf.	95	98	100
JERSEY CENTRAL PWR. & LT., 7% pf.	96	....	....
Jersey Central Pwr. & Lt., pfc., pf.	109	95½	112½
Jersey Central Pwr. & Lt., com.—no par	45	45	50
Johns-Manville, com.—no par.	142	....	....

Stock Exchange: aChicago; bSt. Louis; ePhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high. Saturday, Oct. 16. lBid, low, high, Wednesday, Oct. 20. mLatest quotations available.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Oct. 19	Low 1926	High 1926
KANSAS CITY PWR. & LT., pf..	*k*111¼	107¼	112¼
Kansas Gas & Elec., 7% pf. ex. div.	*l*102½	99	103
Kentucky Hydro-Elec., pf.	*a* 93¼	91¼	95½
Kentucky Sec.,6% pf.	80	..	....
Kentucky Sec., com.	100½	....	....
Kentucky Utilities, 6% pf.	93	90	95
Keystone Pwr. & Lt. 7% pf.	96	95	97
LACLEDE GAS LT., com.	160	146	175½
Lehigh Pwr. Sec., com.—no par	14¼	10	22
Long Island Ltg., 7% pf.	108½	....	....
Long Island Ltg., com.—no par.	130	120	150
Los Angeles Gas & Elec., 6%,pf.	99	....	....
Louisville Gas & Elec., Class. A	23½	22½	26½
MANHATTAN ELEC. SUPPLY..	47½	44	87½
Manila Elec., com.—no par	42	27½	45½
Maytag Mfg., com.	21½	19	24½
Memphis Pwr. & Lt., pf., $7, no par	108	103	109
Metro. Edison, pf.—$6—no par	104½	....	....
Metropolitan Edison, pf., $7, no par.	104	....	....
Metropolitan Edison, com., no par.	50	45	50
Middle West Utilities, 7% pf.	*a*105	97½	111½
Middle West Utilities, 7% pr. lien pf.	*a*115½	106½	123½
Middle West Utilities, com.—no par.	*a*111½	108	134½
Midland Utilities, pr. ln. pf.	*a*100	98	104
Midland Utilities pf. A	*a* 97	96	99½
Milwaukee Elec. Ry. & Lt., 7% pf.	*a* 98	100	102
Milwaukee Elec. Ry. & Lt., 6% pf..	91	87	88½
Minn. Pwr. & Lt., 7% pf.	*l*104½	100	104½
Miss. Pwr. & Lt., pf.	106	102	105½
Miss. River Pwr., 6% pf.	95	....	....
Miss. River Pwr., com.	60	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par.	102	99	105
Mohawk Hudson Pwr., 2nd pf.—$7—no par.	101	....	....
Mohawk Hudson Pwr., com.—no par	23	20½	28½
Montana Pwr., pf.	*m*117½	112½	119½
Montana Pwr., com.	79½	69½	83½
Montreal Pwr., com.	*f* 74½	....	....
Mountain States Pwr. pf.	96	....	....
Mountain States Pwr., com.	18	....	....
NASSAU & SUFFLOK, LTG., pf.	99	....	....
National Carbon, pf.	*m*125½	125	128
National Electric Pwr-A.	*a* 21½	19½	26½
National Elec. Pwr., pf.	*k*101½	94	102½
Nat. Lt., Ht. & Pwr., com.	24	22	25
National Lt., Ht. & Pwr., 5% pf.	72	71	73
National Pwr. & Lt., pf., $7—no par.	101½	96	102½
National Pwr. & Lt., com.—no par..	19½	16½	38½
National Pub. Serv., 7% pf.	90	....	....
National Pub. Serv., pfc. pf.	108	....	....
National Pub. Serv., A com.—no par.	*k* 18½	15½	24
National Pub. Serv., B com.—no par.	14½	10	17½
Nebraska Pwr., 7% pf.	*l*107	103	107½
Nevada-Calif., Elec., com.	*m* 20½	18½	44½
New Brunswick Pwr., pf.	55	30	55
New England Pub. Serv., pr. ln. pf..	99	98	99½
New England Pub. Serv., pf.	93	95½	97
N. J. Pwr. & Lt., 7% pf.	109½	104	110
New Orleans Pub. Serv., 7% pf.	103	....	....
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	89	....	....
N. Y. Central Elec., 7% pf.	98½	98	100
Newport News & Hampton Ry., Gas & Elec., com.	109	98	112
Newport News & Hampton Ry., Gas & Elec., pf.	109	98	114
Niagara Falls Pwr., 7% pf.—25..	*k* 28½	27½	28½
Niagara, Lock. & Ont. Pwr., 7% pf...	109	110	111½
No. Amer., 6% pf.—50.	*k* 51	49	52½
No. Amer., com.—10.	48½	42	67
No. Amer. Edison pf.—no par.	96½	91½	96½
No. Amer. Lt. & Pwr., pf.	101	88	104
No. American Utilities, pf., full pd..	*m* 94½	89	96
No. American Utilities, pf., 25% pd.	*m* 19	18	27
N.C. Pub. Serv., pf.—$7—no par...	93	....	....
Northeastern Pwr., com.	16	15½	36½
No. Indiana Gas & Elec., pf. A.	101	98	103½
No. Indiana Public Service—pf.	103	....	....
No. N. Y. Utilities, 7% pf.	103	....	....
No. Ohio Pwr., com.—no par.	12½	11	26½
No. Ohio Trac. & Lt., 6% pf.	78	78	81
No. Ohio Trac. & Lt., 7% pf.	91	88	96
No. Ont. Lt. & Pwr., pf.	83	....	....
No. Ont. Lt. & Pwr., com.	73	45	75
No. States Pwr., 7% pf.	101½	....	....
No. States Pwr. com.	104¼	97	136½
No. Texas Elec., 6% pf.	61	....	....
No Texas Elec., com.	22	....	....
OHIO BRASS, com. B—no par...	70	70	79
Ohio Brass, pf.	100	98	101
Ohio Gas & Elec., 7% pf.	94	92	95
Ohio Pwr., 6% pf.	95	93	96
Ohio Pub. Serv., 6% pf.	*l* 94½	90	96½
Ohio Pub. Serv., 7% pf.	*l*102½	96	102½
Ohio River Edison, pf.	101½	....	....
Oklahoma Gas & Elec., pf.	96	....	....
PACIFIC GAS & ELEC., 6% pf...	*a*00	....	....
Pacific Gas & Elec. com.	128½	118	133½
Pacific Pwr. & Lt., 7% pf.	*l*102	98	102½
Parr Shoals Pwr., 6 % pf.	92	....	....
Penn Central Lt & Pwr., pf.—no par	*c* 73	70½	91
Penn-Ohio Edison, 7% pf.	95½	....	....
Penn-Ohio Elec., 7% pf.	96	93	96
Penn-Ohio Pwr. & Lt., 7% pf.	98	....	....
Penn-Ohio Pwr., & Lt., 8% pf.	109	....	....
Penn Pwr. & Lt.—$7—no par.	*l*106½	103	108½
Penn Pub. Serv., 7% pf.	103	96	103
Penn Pub. Serv., 6% pf.	87	85	90
Penn Wtr. & Pwr., com.	*e*164	141	171
Phila. Co., 6% pf.—50.	*c* 48½	48½	50½
Phila. Co., com.—50.	71	59½	76½
Phila. Elec., com.—25.	*c* 48½	41½	67½
Pittsburgh Utilities, pf.—10.	*m* 19½	14½	20½
Portland Elec. Pwr., 7% pf.	97	....	....
Portland Elec. Pwr., 6% pf.	83	....	....
Portland Elec. Pwr., 6% 2nd pf.	71	....	....
Portland Elec. Pwr., com.	27	....	....
Potomac Elec. Pwr., pf.	*j*107½	....	....
Pwr. Corp. of N.Y., com—no par...	*m* 79	77½	90½
Pwr. Sec., pf.—no par.	*k* 24	10	29
Pwr. Sec., com.—no par.	*k* 6	4	13
Pub. Serv. of Colorado 7% pf.	*l* 99	96	100
Pub. Serv. of N. J., 7% pf.	108½	103½	109½
Pub. Serv. of N. J., 8% pf.	123	115	123½
Pub. Serv. of N. J., com.—no par..	93½	72	97½
Pub. Serv. of No. Ill., 6% pf.	*a*101	100½	106
Public Serv. of No. Ill., 7% pf.	*a*114½	112	116½
Pub. Serv. of No. Ill., com.—no par	*m*131½	128½	140
Pub. Serv. of No. Ill., com.	*k*130	126	135
Pub. Serv. of Okla., 7% pf.	98	92	97
Pub. Serv. Elec. & Gas, 6% pf.	*k*102½	97	104½
Public Service Elec. Pwr., pf.	*k*111½	106	114
Puget Sound Pwr. & Lt., 7% pf.	102½	....	....
Puget Sound Pwr. & Lt., 6% pf.	83½	....	....
Puget Sound Pwr., & Lt., com.	27	26	66½
RADIO CORP. OF AM., pf.—50.	49½	44½	49½
Radio Corp. of Amer., com.—no par.	55½	32	57½
Republic Ry. & Lt., pf.	109	....	....
Republic Ry. & Lt., com.	88	....	....
Rochester Gas & Elec., 5% pf.	*m* 95	80	98½
Rochester Gas & Elec., 6% pf.	*k*102	100	103
Rochester Gas & Elec., 7% pf.	105	....	....
SAN JOAQUIN LT. & PWR., 7% pf.	97	97½	98½
Safety Cable, com.	50½	42½	55
St. Joseph Ry., Lt., Ht. & Pwr., pf...	67	60	70
Servel Corp.	15½	14½	22½
Sierra Pacific Elec., com.	24	23	28½
Sioux City Gas & Elec., 7% pf.	99½	....	....
S. E. Pwr. & Lt., pf.—$7—no par..	99½	....	....
Southeastern Pwr. & Lt., ptc. pf.	67	....	....
S. E. Pwr. & Lt., com.—no par.	28½	20	46½
So. Calif. Edison, 8% pf.—25.	33	32½	33½
So. Calif. Edison, 7% pf.—25.	*g* 27½	....	....
So. Calif. Edison, 6% pf.—25.	24½	....	....
So. Calif. Edison, com.	31	30½	33
Southern Cities Utilities, 7% pf.	84½	....	....
Southern Cities Utilities, com.	34	....	....
Southwestern Lt. & Pwr., A.	60	....	....
Southwestern Lt. & Pwr., B.	60	....	....
Southwestern Lt. & Pwr., $6 pf.	80	....	....
Southwestern Pwr. & Lt., 7% pf.	*k*104	100	105
Springfield (Mo.) Ry & Lt., 7% pf.	97	95	100
Standard Gas & Elec., 8% pf.	55½	53½	57½
Standard Gas & Elec., 7% pf.	101	....	....
Standard Gas & Elec., com.—no par.	54	51	69
Standard Pwr. & Lt., 7% pf.	95	....	....
Staten Island Edison, pf.–$6–no par	95½	....	....
Superheater, com.—no par.	152	....	....
Syracuse Lighting, 7% pf.	102	105	107
Syracuse Lighting, 8% pf.	115	....	....
Syracuse Lighting, com	340	260	355
TAMPA ELEC., com.	49	....	....
Tenn. Elec. Pwr., 6% pf.	88	....	....
Tenn. Elec. Pwr., 7% pf.	102½	....	....
Terre Haute, Ind. & East Trac., pf..	20	20	37
Terre Haute, Ind. & East. Trac., com	1	1	7
Tex. Pwr. & Lt., 7% pf.	*l*106	102	107½
Tide Water Pwr., 8% pf.	104½	....	....
Timken Roller Bearing, com—no par	75½	44½	75½
Toledo Edison, 8% pf.	*l*113	111	113
Toledo Edison, 7% pf.	*l*103	101	103
Toledo Edison, 6% pf.	*l* 94½	90	94½
Toledo Edison, com.	100	....	....
Tri-City Ry. & Lt., 6% pf.	88	87½	89
UNITED GAS & ELEC., 6% pf..	97½	....	....
United Gas & Elec., com.—no par..	*m* 57	56	66
United Gas & Elec. (N.J.), 5% pf....	70	....	....
United Gas Impr.—50.	*c*107	84½	144½
United Lt. & Pwr. pf.—$4—no par.	50½	44	51
United L. & P. pf.—$6.50—no par..	87½	81	91
United Lt. & Pwr., com., A—no par	*a* 11½	11½	26
United Lt. & Pwr., com., B—no par	*a* 15	15	31
Utah Pwr. & Lt., 7% pf.	*l*103	99	103½
Utica Gas & Elec., 7% pf.	105	....	....
Utica Gas & Elec., com.	200	....	....
Utilities Pwr., & Lt., 7% pf.	92	....	....
Utilities Pwr. & Lt., com A	29½	28½	37
Utilities Pwr. & Lt., com. B—no par	13½	13½	18½
VERMONT HYDRO - ELEC., 7% pf.	94	94	96
Virginia Elec. & Pwr., 7% pf.	104	104	105½
Virginia Pwr., 7% pf.	108	102	104
Virginian Pwr., com.	70	65	75
WAGNER ELEC., pf.	*b* 74	61½	85
Wagner Elec., com.—no par.	*b* 24	13½	34½
Washington Ry. & Elec., com.	*j*190	....	....
Washington Ry. & Elec., pf.	*j* 89½	....	....
Washington Wtr. Pwr., com.	132	130	136
West Mo. Pwr., 7% pf.	92	....	....
West Penn., 7% pf.	*m*115	108	115
West Penn, com.	*m*125	118	130
West Penn Elec., pf.	98½	95½	101
West Penn Elec., Class A.	*k* 92	88½	98
West Penn Pwr., pf.	*k*113	108	115
West Va. Lt., Ht. & Pwr., 7% pf...	94½	95	98
West Va. Uti ities. 7% pf.—50.	46	43	48
Western Pwr., 7% pf.	97	....	....
Western States Gas & Elec., 7% pf.	92	....	....
Western States Cas & Elec., com.	16	....	....
Westinghouse El. & Mfg., com—50.	67½	65	79½
Weston Elec. Instrument, Class. A..	32½	27½	32½
Weston Elec. Instrument, com.	16½	13½	19½
Wheeling Elec., pf.	95	92	96
Wis. Pwr., Lt. & Ht., 7% pf	*k* 90	85	90
Worthington Pump, pf. A.	*k* 63	63	80
Worthington Pump, pf. B.	50½	50½	65
Worthington Pump, com	28	20½	44½
YADKIN RIVER PWR., 7% pf...	*l*106½	102	107½
Yale & Towne, com.—25.	*k* 68	60½	72½

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid, low, high, Saturday, Oct. 16. *l*Bid, low, high, Wednesday, Oct. 20. *m*Latest quotations available.

the expenditure of additional capital. In general, all utilities have been rebuilding and increasing service standards, and this has led to a large increment of new capital investment. The current low price of money is also a factor; it by no means explains the whole situation.

But explanations of what has caused the decline do not help much in finding a remedy. The central fact is that the capacity factor must be increased. The off-peak load must be brought nearer the peak. Otherwise expressed, more of the capacity must be pressed into use. Capital today demands adequate returns year by year. The investor is not satisfied with the promise of a certain rate of return at some future time when system capacity becomes fully operative. He wants to see profits today.

How this can be accomplished the industry itself must determine. The open way apparently is by a more intensive application of existing facilities and the use of new electric services. All present loads offer great possibilities for building energy sales and increasing revenue. An analysis made recently by ELECTRICAL WORLD indicates, for example, that in the residential field the load is only 7.3 per cent developed. In power and in heating there is vast room for expansion. Commercial lighting shows the highest percentage of development, but there is still a tremendous volume of possible new business. Executive thought must be devoted to these business possibilities, but in the last analysis the responsibility for the addition of new load rests with the central-station companies' sales organizations.

Malone Utility Increases Capital Stock.—The Malone (N. Y.) Light & Power Company has filed a certificate in the office of the Secretary of State through Sullivan & Cromwell, attorneys, New York City, increasing its capital stock from 6,000 shares of $100 par value to 18,000 shares, consisting of 3,000 shares preferred stock $100 par value and 15,000 shares common stock no par value.

New German Loan Raised

Public offering of the two-and-a-half-million-dollar issue of the Unterelbe Power & Light Company's fifteen-year 7 per cent sinking-fund mortgage gold bonds, referred to in the Oct. 16 issue of the ELECTRICAL WORLD, was made last Tuesday, the price being 99¼ and accrued interest, to yield about 7.08 per cent. The company supplies electric light and power without competition in the city of Altona and certain nearby districts, serving directly and indirectly a population of approximately 260,000 with electricity, gas and water. These bonds will be direct obligations of the

company and will be secured, in the opinion of counsel, by a direct mortgage in the gold-mark equivalent of at least the principal amount of bonds outstanding on the company's electric light and power properties, its gas generating plant and its water filtration, central pumping and supply plant. Proceeds of these bonds will be used for additions.

Detroit Edison Will Issue Additional Capital Stock

To stockholders of the Detroit Edison Company of record Oct. 29 will be offered the right to subscribe at par ($100) for additional stock of the company equal to 10 per cent of their holdings. Subscriptions will be payable in full on Dec. 21, 1926, or payable in four equal installments on Dec. 21, 1926, March 22, 1927, June 21, 1927, and Sept. 21, 1927. Holders of convertible bonds desiring to participate in the offering should arrange to convert their bonds on or before Oct. 29. In a letter to stockholders notifying them of their subscription rights, Alex Dow, president, says:

"Reimbursement of the company's treasury for the somewhat heavy construction expenditures was accomplished in part by the sale in June of $15,000,000 of 5 per cent general and refunding bonds. Last year we sold at the same season a lesser amount of bonds and made an offering of new stock in October. This letter is to announce the offering of new stock in December of this year for the purpose of providing funds for further additions to the company's plants and system. This issue will bring the total stock outstanding to approximately $88,600,000. The exact figure will depend upon how many of the remaining convertible debenture bonds (about $2,300,000) are exchanged for stock in the meantime. The total amount of mortgage bonds outstanding is $84,484,000."

New Capital Issues

During the week ended Oct. 21 the Public Service Company of New Hampshire issued 34,100 shares of $6 dividend preferred stock, the price being $95 and dividend a share, to yield about 6.32 per cent. The company is the largest public utility in New Hampshire and serves with electric light and power the thickly populated manufacturing district along the Merrimac River, including the cities of Manchester and Nashua, the two largest cities in the state, as well as Keene, Laconia and surrounding towns. Proceeds of this issue of stock, together with the proceeds of bonds to be presently issued, will be used to retire capital obligations of the merged companies and to reimburse the company for additions to plant completed and now under construction.

An offering of 30-year first lien gold bonds of the Federal Light & Traction Company, bearing interest at the rate of 5 per cent, was made in the amount of $1,329,000. These bonds, dated March 1, 1912, and maturing March 1, 1942, were priced at 95½ and interest, to yield about 5.40 per cent. The annual interest requirements of the first lien bonds now outstanding, including this issue, will amount to $437,270. Net earnings for the seven years ended Dec. 31, 1925, averaged over three times and for the twelve months ended July 31, 1926, amounted to more than four and four-tenths times such requirements. Proceeds of this issue will be used in part to reimburse the company's treasury for capital expenditures already made and for other corporate purposes.

The Suburban Light & Power Company (Ohio) offered an additional issue of 7 per cent cumulative first preferred stock, totaling $500,000. The price was 95 and accrued dividend, to yield about 7.37 per cent. Proceeds will be used to reimburse the company for the cost of additions and improvements to present properties and for other corporate purposes.

A new issue of collateral trust seven-year 6½ per cent sinking-fund convertible gold notes of the Coldak Corporation was offered during the week, a piece of financing involving $1,150,000.

Boston Edison Stockholders to Meet.—A special meeting of stockholders of the Edison Electric Illuminating Company of Boston has been called for Nov. 1 to vote on an increase in authorized capital and the issuance of additional capital stock to pay liabilities incurred for additions and extensions to the plant and property of the company.

Public Service Stockholders Approve Stock Increases.—Stockholders of the Public Service Corporation of New Jersey, meeting in Newark, Oct. 19, voted approval on the capital readjustments recommended by the directors as outlined in the Oct. 2 issue of the ELECTRICAL WORLD. These called for an increase in preferred stock from $100,000,000 to $200,000,000 and an increase of no-par common stock from 2,000,000 to 10,000,000 shares. Three shares of new no-par common are to be exchanged for each share outstanding, the remaining 6,422,725 shares remaining in the treasury.

Company Reports

The following statements of earnings have been issued by electric light and power companies for the month of September:

Name of Company	Gross Earnings for September 1926	1925
Adirondack Power & Light....	$790,116	$698,926
Detroit Edison.....	3,535 612	3,146,379
Federal Light & Traction*....	510,273	445,970
Southwestern Power & Light*	1,268,326	1,158,984

* August.

Houston Earnings Up 30 per Cent

National Power & Light Subsidiary Shows 50 per Cent Increase in Balance After Preferred Dividends Have Been Accounted For

VALUABLE additions to the property of the Houston Lighting & Power Company and the rapid, substantial growth of the city of Houston made possible a 22 per cent increase in gross revenue and a 30 per cent rise in net for the year ended July 31. The addition of 125 miles of distribution lines and 108 miles of high-voltage transmission lines, with 41 miles more under construction, has added nearly 8,000 new customers.

The gross earnings of the company for the period under discussion were $4,325,194, against $3,546,460 the year before. Operating expenses and taxes took $2,412,538, or 56 per cent of gross. With other miscellaneous income this left a net of $1,936,071, against $1,499,618 the previous year—a 29 per cent increase. Interest charges of $507,232 were thus earned three and eight-tenths times. Other interest and deductions, including interest on bank loans and on loans to subsidiaries, amounted to $81,934, leaving a balance of $1,346,905 before preferred dividends. This is 44 per cent larger than the corresponding balance for the previous year. Preferred dividends required $210,000, leaving a balance of $1,136,905, from which must be deducted whatever amount is allowed for renewal and depreciation reserves. No dividend was paid on common stock.

The capital structure of the company as of July 31 consisted of a funded debt of $10,000,000 first lien and refunding bonds, series A, B and C; an issue of $4,503,000 first mortgage bonds, of which only $2,403,000 is in the hands of the public; $3,000,000 of 7 per cent cumulative preferred stock, and 200,000 shares of no-par common.

Customer ownership of stock is a feature of the Houston company. There are now in Texas about 1,500 holders owning more than 28,000 shares of the preferred stock. In connection with last year's financing 4,430 shares of preferred were sold to the public in Houston and vicinity. The company's operations are supervised by the Electric Bond & Share Company.

Dividends Declared

The quarterly dividends listed below have been announced by electric light and power and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
Brazilian Traction, Lt. & Pwr., com.	1½	Dec. 1
Broad River Power, pf.....	1¾	Nov. 1
Columbia Gas & Elec., com.....	$1.25	Nov. 15
Community Pwr. & Lt., 1st pf.....	1¾	Nov. 1
Community Pwr. & Lt., 2d pf.....	2	Dec. 1
Dallas Power & Light, pf.....	1¾	Nov. 1
Knoxville Power & Light, pf.....	$1.75	Nov. 1
Long Island Ltg., com.....	.50	Nov. 1
Middle West Utilities, com.....	$1.50	Nov. 15
National Electric Power, com. A....	.45	Nov. 1
North West Utilities, 7% pf.....	$1.75	Nov. 15
Pacific Power & Light, pf.....	1¾	Nov. 1
Sierra Pacific Elec., com.....	.50	Nov. 1
Sierra Pacific Elec., pf.....	1¾	Nov. 1
Southern California Edison, com....	.50	Nov. 15
Southern Wisconsin Electric, com...	2	Oct. 21
Standard Power & Light, cum. pf...	$1.75	Nov. 1
Tennessee Electric Power, 6% pf....	$1.50	Jan. 2, '27
Tennessee Electric Power, 7% pf....	$1.75	Jan. 2, '27
Tennessee Electric Power, 7.2% pf..	$1.80	Jan. 2, '27
Tennessee Electric Power, 6% pf.*..	.50	Nov. 1
Tennessee Electric Power, 6% pf.*..	.50	Dec. 1
Tennessee Electric Power, 6% pf.*..	.50	Jan. 2, '27
Tennessee Electric Power, 7.2% pf.*	.60	Nov. 1
Tennessee Electric Power, 7.2% pf.*	.60	Dec. 1
Tennessee Electric Power, 7.2% pf.*	.60	Jan. 2, '27
Texas Power & Light, pf.....	1¾	Nov. 1

* Monthly

Manufacturing and Markets

No Jobbers' Medal This Year

Judges in McGraw Contest Award Four Certificates of Honorable Mention for Distinguished Service by Executives, but Withhold Medal and Purse

AT THE second annual presentation of the James H. McGraw award to electrical jobbers, which was a feature of the convention of the Electrical Supply Jobbers' Association this week at the Hotel Traymore, Atlantic City, certificates of honorable mention were extended to four prominent jobber executives in recognition of distinguished service to the electrical jobbing industry.

The medal and purse were withheld this year, however, because, in the opinion of the judges, no definite outstanding contribution to the advancement of the jobbing industry worthy of the McGraw medal was recorded during the year 1925. The committee of judges comprised George A. Cullinan, vice-president Graybar Electric Company, New York; Frank S. Price, president Pettingell-Andrews Company, Boston; V. C. Bruce Wetmore, president Wetmore Savage Electric Company, Boston, and W. E. Robertson, vice-president Robertson-Cataract Electric Company, Buffalo.

The four certificates of honorable mention were extended to William S. Berry, Harry F. Thomas, Thomas J. Creaghead and Warren I. Bickford with the following citations:

WARREN I. BICKFORD, secretary and treasurer Iron City Electric Company, Pittsburgh, for many years an outstanding figure in the counsels of the electrical jobbing industry and a member of the executive committee of the Electrical Supply Jobbers' Association, has proved himself one of the clearest thinkers in the organization and in the leadership of many important committee assignments has been a consistent builder for progress in electrical distribution. More recently he has undertaken the reorganization and executive direction of the E.S.J.A. catalog committee's project to provide for the benefit of jobbers and their customers improved methods and enlarged facilities for cataloging electrical supplies, and he has carried through a difficult and exacting responsibility with unusual efficiency and success.

WILLIAM S. BERRY, manager Graybar Electric Company, San Francisco, for twenty years or more a consistent and tireless worker for the encouragement of high ideals of service among the electrical jobbing fraternity of the Pacific Coast, has contributed innumerable ideas for the betterment of jobbing conditions in the far West. He has been an outstanding leader in co-operative work. He has served the Pacific Coast Jobbers' Association as chairman and in every capacity on committees. He was a large factor in developing the California Electrical Co-operative Campaign and the California Electrical Bureau. He was a member of the advisory committee in the promotion of the convenience outlet, the electrical home and the "red seal" campaigns. He was one of the early presidents of the San Francisco Electrical Development League in the days when the league was languishing for lack of interest, and he contributed largely to bringing about its present position of importance. He has taken a broad constructive interest in the welfare of the electrical contractor and has worked indefatigably to promote contractors' organizations and to awaken them to a full responsibility in their relations with the other branches of the industry. In a word, the name of William S. Berry has become inseparably identified with the growth of the electrical industry in all its phases throughout the entire Pacific Coast.

HARRY F. THOMAS, president Northwestern Electric Equipment Company, St. Paul, as the result of continued study of the statistics of distribution in the electrical industry, has become an authority on the broad principles of cost accounting for the supply jobber. Following an exhaustive study of the costs of handling individual commodities conducted under his direction several years ago in a number of jobbing houses and published by the Electrical Supply Jobbers' Association for the information of the electrical industry, he has continued a close student of the problem and by encouragment and co-operation has undoubtedly exerted a far-reaching influence for the improvement of the position of the electrical jobber from the standpoint of operating cost knowledge and gross profits by commodities.

THOMAS J. CREAGHEAD, president Creaghead Engineering Company, Cincinnati, for several years representative of the Electrical Supply Jobbers' Association on the electrical committee of the National Fire Protection Association and therefore spokesman for the electrical jobbing industry in the development and administration of the National Electrical Code, has given himself to the work with rare zeal and judgment and effectively presented the interests of distribution in the consideration of code rulings. At the same time he has become the recognized authority and interpreter of the code to the jobbing industry, this through a period of unusual activity in code development entailing a heavy demand upon his time and thought.

PURPOSE OF AWARDS

The James H. McGraw award was established last year by Mr. McGraw "to encourage constructive thinking for the advancement of the electrical industry." Its permanence has been secured by an endowment given into the keeping of the Society for Electrical Development. Each year four bronze medals are awarded, each accompanied by a purse, to those men who are judged to have done most for the advancement of the manufacturing, jobbing or contractor-dealer branches of the industry or to promote co-operation between any two or more branches of the industry. The presentation of the certificates was made by Earl E. Whitehorne, commercial editor of the ELECTRICAL WORLD, in behalf of the committee.

Increased Duty Advocated on Tungsten Ore

A second application calling for a 50 per cent increase in the duty on tungsten has been filed with the United States Tariff Commission. A previous application for the full amount of the duty allowed by the flexible provisions of the tariff act was filed on May 15, 1925, by the Madison Mining Corporation, Morristown, N. J. The present duty on tungsten ore and concentrates is 45 cents per pound.

Tungsten specialists in Washington, D. C., expect the import movement to continue, as it is their understanding that the speculative stocks in the country are about exhausted. This does not mean, however, that the stocks of consuming interests are particularly low. In fact, there is positive information that no shortage is threatened. It also is noted that the higher prices for tungsten which have prevailed since March, 1925, have stimulated research on molybdenum and other substitutes.

Electric Industrial Trucks and Tractors

September shipments of electric industrial trucks and tractors, as reported to the Department of Commerce by the nine leading manufacturers in the industry, were 97, the same number as in August. The accompanying table shows the detailed figures by quarters for the year 1925 and by months since January, 1926.

SHIPMENTS OF ELECTRIC INDUSTRIAL TRUCKS AND TRACTORS

	Domestic		
1925		All Other	
Quarter ended:	Tractors	Types	Exports
March 31	45	259	41
June 30	49	280	50
Sept. 30	57	286	12
Dec. 31	41	295	25
Total	192	1,120	128
1926			
Quarter ended:			
March 31	47	310	17
June 30	50	281	32
Sept. 30	39	258	8
January	21	86	4
February	15	96	5
March	11	128	8
April	17	90	4
May	12	87	9
June	21	104	19
July	15	95	1
August	14	81	2
September	10	82	5

Sales Statistics on Direct-Current Motors

Orders entered for direct-current motors during the month of August showed an increase over those entered

ORDERS ENTERED AND SALES BILLED FOR DIRECT-CURRENT MOTORS

(1-hp. to 200-hp. inclusive, built in general-purpose motor frames, including control equipment sold with motors and excluding spare parts.)
(Issued by National Electrical Manufacturers' Association— Apparatus Division)

Month, 1926	Orders Entered	Billings
January	$815,976.75	$934,124.01
February	878,028.36	807,281.31
March	1,167,748.91	1,027,318.84
April	866,858.52	821,946.62
May	740,231.54	793,832.28
June	904,269.40	928,272.41
July	740,424.22	876,257.25
August	792,613.03	876,296.67
Year to date	$6,906,150.73	$7,065,329.39

in July, but with only one other exception—orders entered in May—those of August were the lowest of the year. Sales and billings from January to and including August are shown in the accompanying table and include control equipment sold with the motors.

Underwriters' Laboratories Adopt New Procedure

Covers Applications for the Review and Classification of Appliances Used in Wiring

ADOPTION of a new standard method of procedure by the Underwriters' Laboratories in acting upon applications for review and classification of appliances, devices, materials and methods used in the installation of electric wiring within buildings has been announced. The procedure was worked out at the request of and in conference with the manufacturers' representatives of the Underwriters' Laboratories and the Electrical Manufacturers' Council.

Appliances, materials and methods submitted as above fall into one of three groups with respect to their status under the installation regulations of the National Electrical Code, and the standards and requirements of the Underwriters' Laboratories, as follows:

Group 1.—Appliances, materials, methods, etc., which are judged by the Laboratories to be not in conflict with the National Electrical Code and which are of a sort intended for uses similar to those of devices already listed and for which the Laboratories have existing standards or laboratory requirements and for which industry conferences are established.

Group 2—Appliances, materials, methods, etc., which are judged by the Laboratories to be not in conflict with the National Electrical Code and with respect to which there are no existing standards or laboratory requirements and no established industry conferences.

Group 3—Appliances, materials, methods, etc., which the Laboratories determine are in conflict with the National Electrical Code.

The procedure of the Laboratories with respect to applications determined by it to be either Group 1, Group 2 or Group 3, as above, shall be as follows:

PROCEDURE GROUP 1.—When the review program of the appropriate standard or laboratory requirements develops conformity therewith, the usual routine course of report to the Underwriters' Laboratories' electrical council, listing with card report and follow-up service shall be taken.

When the conflict with the standard is determined by the Laboratories and either the submitter or the Laboratories feel that the merits of the device or method justify recognition in the standard, the matter shall be taken up with the established industry conference or at a conference with makers of devices for the same uses which are already listed, with a view to having the standard so amended as to remove the conflict. In case such amendment is determined upon, the routine course shall be taken.

PROCEDURE GROUP 2.—Having determined that the device is of this group, the Laboratories shall prepare a program of review and tests which they consider essential and adequate. If the outcome of the application of the program is acceptable, the Laboratories shall submit a report to their electrical council recommending appropriate card report, listing and follow-up service.

Subsequently, when several other submitters seek like action on devices intended for a like use, the Laboratories shall prepare an appropriate standard, discussing its provisions with interested manufacturers in a meeting or through an industry conference, if one is organized. Thereafter, devices of this sort classify under Group 1 of this procedure. At an appropriate time the manufacturers, singly or in a body, the Laboratories, or other interested party, may apply through regular channels for recognition of the class in the National Electrical Code.

PROCEDURE GROUP 3.—Having determined a conflict, the Laboratories shall so advise the submitter. Upon the latter's request, the Laboratories may then undertake the preparation of a fact-finding report, first preparing a program of review and tests which they consider adequate and essential. The report shall treat of the general properties and features of the product and may, if judged proper by the Laboratories, include data as to comparative properties and features of well-known or established products. Such fact-finding report shall not include conclusions or recommendations by the Laboratories with respect to the merits or demerits of the product in connection with its projected use. The release of such report to the submitter assumes any desired use of it by him. If requested by the submitter, the Laboratories may advise the submitter orally relative to his applying for appropriate amendment of the national electrical code and as to the procedure in so doing. The submitter may file a copy of the Laboratories' fact-finding report with his application.

When such an application has been regularly referred to an article committee of the electrical committee (N.F.P.A.), and the article committee so requests, the Laboratories may advise the article committee of their views and opinions. If these advices are given other than orally or by a member of the staff of the Laboratories serving as a member of the article committee, (in other words if they are as formal report of the organization), they shall be transmitted only through the chairman of the electrical committee for simultaneous delivery to the membership of the article committee and to the applicant. If judged necessary or advisable by the Laboratories' management such reports, whether fact-finding or opinion reports to an article committee, may be submitted to the electrical council of the Underwriters' Laboratories for ratification before release either to the submitter or to the article committee. The Underwriters' Laboratories will make no other release of either a fact-finding or an opinion report while the subject remains in the category of this group. Provided a change is made in the National Electrical Code removing the conflict, the further procedure with respect to Group 3 becomes that of Group 1 or 2.

Business Conditions

LITTLE change in general business conditions has occurred during S0 the past week. Utility buying is rather quiet for major construction projects and the preparation of budgets for next year holds their attention. Electrical merchandise and industrial electrical equipment continue in steady demand, and the general opinion is that good electrical business will prevail during the rest of the year. Economists and business leaders are not in agreement as to future business, but as measured by electrical barometers there are no clouds on the business horizon.

On the Pacific Coast an active merchandising campaign by the utilities has maintained the demand for equipment. Business also holds up well for miscellaneous electrical equipment for stores, street lighting, theaters and industrial motors. In the St. Louis district the motor demand continues steady, but in the Southeast business remains a little slow. The reaction to low cotton prices and activity in handling the cotton crop has slowed up buying of power equipment, but merchandise is moving steadily. Normal business in all lines is reported from Chicago, New York and New England. The general opinion in the electrical industry is that business will continue to be very satisfactory for some time.

Metal Markets Featured by Heavy Lead Sales

The only really active sellers in the non-ferrous metal markets in the week ended Wednesday were the lead producers, practically all of whom report unusually heavy business, some of which was stimulated by price concessions. Zinc and tin have been in about average demand and copper has had a quiet week, especially in the last three days. Silver took a violent dip to a new low of 51¼ cents.

Only a moderate interest has been taken in copper. The firmness attendant upon the announcement of the export plans has been well maintained in the export market, but domestic prices, after advancing to as high at 14.20 cents, delivered in the East, have receded to 14⅛ cents or less. Fair business was done in the Middle West on Thursday, Friday and Saturday, at from 14.25 cents to 14.375 cents, Eastern business being booked on the same days at from 14.075 cents to 14.20 cents. Since then but little copper has been sold, chiefly at 14¼ cents delivered in the East, at which price copper could be obtained from almost any producer, though there is little pressure to sell. Some concessions were made on Wednesday though no actual sales less than 14.10 cents were reported. Most of the business has been for November-December, though there was a little prompt shipment specified.

NEW YORK METAL MARKET PRICES

	Oct. 13, 1926 Cents per Pound	Oct. 20, 1926 Cents per Pound
Copper electrolytic	14.15	14.15
Lead, Am. S. & R. price	8.35	8.35
Antimony	13¾	14¼
Nickel, ingot	35	35
Zinc spots	7.65	7.65
Tin, Straits	70	69¾
Aluminum, 99 per cent.	27	27

Base copper price Oct. 20, 1926, 16¼ cents.

In the last three days a good tonnage of lead has been sold at 8 cents flat, St. Louis, though this price cannot be said to be general and is not quoted for small lots. Storage-battery manufacturers have been particularly active buyers, specifying increased tonnages under average price contracts. November lead has been in somewhat greater demand than October. Only two orders for December lead are reported.

Zinc has sold in slightly better volume than last week, galvanizers taking moderate tonnages for both October and November shipment. Prices advanced for two or three days, 7⅞ cents having been obtained on two or three sales on Saturday, but since then, with lower prices cabled from the other side, have receded to the level of a week ago.

New England Sales Reported Spotty

Unevenness in the buying tone continued to mark the trend in New England during the past week with a falling off noted in the demand for central-station supplies. Few orders were placed for industrial equipment, and the call for new construction material slowed up. Standing out as an item of exceptional interest, however, was the strong activity in small-motor buying. As reported by one manufacturer, the week's sales reached more than $100,000, with the call for fractional sizes leading. Another interesting order was for a waterwheel and generator, with a capacity of 2,500 hp., for an addition to a southern New Hampshire hydro-electric plant. Increasing activity in industrial electric lighting is reported, and the movement in reflectors and commercial-type fixtures is gaining strength.

Negotiations continue to demand attention, and inquiries are maintaining a steady level. In view of these indications, which point to favorable conditions ahead for the remainder of the year, what appears to be a temporary slowing up in trade in this district affords little foundation for pessimism. With construction nearing a close on many projects, new undertakings are continually appearing in the field. Substation and line extensions are contemplated at a number of places in the district.

Household appliance sales are gaining gradually and jobbers are reporting a strong interest in various appliances. Washers, flatirons and cleaners lead. Portable-lamp sales are increasing. Radio accessories gained 25 per cent for the first two weeks in October as compared with last year.

Business in Middle West Holds Up Well

Evidence of good business is apparent throughout all sections of the Middle West. The volume of business is holding up well as indicated by a record car loading and good reports from industrial establishments. Building activity apparently is continuing at a high level with an increasing number of persons employed. The various utility companies are busy extending service lines and many small construction jobs are under way. A fairly large demand for distribution transformers has been noted this month. One order for fifteen 150-kva. and fifteen 200-kva. pole-type transformers was placed this week. Among other interesting orders placed were the following: 8,000 5-amp. wattmeters, 540 Thompson meters, 10 amp. to 2,000 amp.; 34 current transformers, one 4,000-kva., three-phase, 60-cycle, 12,000-volt power transformer and a quantity of disconnecting switches. Maintenance purchases have been running rather heavy, with a good demand noted for pole-line hardware and insulators.

Jobbers' sales remain generally satisfactory. Appliances continue to move readily, with a particularly good demand noted for vacuum cleaners. One jobber placed a single order for 3,000 machines. Radiant heaters are beginning to move with the cooler weather. Prices remain generally firm. Copper base advanced ¼ cent per pound followed by an advance of 3 per cent in the price of code wire.

Buying Is at Normal Rate in New York Area

A little increase in central-station buying in the New York district is apparent in the last week, although some lines are still inactive. The demand for generating equipment and transformers remains dull, and there is not much improvement in the sales of insulators, pole-line hardware, etc. The situation in regard to switching equipment is better, but here, too, individual orders are generally small. Poles and cross-arms are stronger, and a decided increase is particularly noted in the number of inquiries received for quotations on this material. The magnitude of the inquiries here also points to a demand for maintenance materials, and no new construction of any great magnitude is indicated. The industrial demand for motors is good, and a fair degree of interest is being shown in fractional-horsepower motors for the sewing-machine trade. Sales of control apparatus have fallen off sharply during the past week. Steel mills and railroads are active in buying circuit breakers, one manufacturer reporting that sales this month exceed any corresponding period since March.

Fall Trade Good in Southeastern Cities

Despite the fact that the low price of cotton has served somewhat to slacken business activities and has operated against too great optimism, the fall trade continues in good volume, particularly in the larger centers. Electric refrigerators are still in excellent demand, the Georgia distributor for one of the largest manufacturers reporting its August sales as 400 per cent of quota and September sales as 287 per cent of quota, with all indications that October will be quite as good as September. One Tennessee power company has recently closed a campaign that resulted in sales of 440 electric refrigerating units. Several 60-watt incandescent-lamp sales campaigns are under way in the territory, and one recently conducted in a southeast Georgia town resulted in the sale of 17,000 lamps on the six 60-watt sales plan. Portables are going well in the larger centers, with one central-station company reporting the sale of approximately one thousand in a three weeks' campaign just finished.

No orders for large apparatus have been received recently, and industries seem to be engaged in preparing budgets and plans for the coming year. Central-station purchases continue satisfactory, particularly for line materials going into middle and south Georgia extensions. One power company has ordered 72 miles of No. 3/0 aluminum, 31 miles of No. 1/0 copper and 21 miles of No. 4 steel-cored aluminum strand during the past ten days. Two orders aggregating 335 50-ft. poles are also reported. Pole-line hardware is in reasonably good demand, with a scattering of orders for line construction tools.

Electric sign activities are brisker than for some time past as a result of special efforts by central stations and sign manufacturers, and while no large installations have been reported recently, a very satisfactory volume of small installations has been signed up and inquiries in hand are in good number. Two large industrial projects are pending, and announcement of definite plans is expected next week, with construction to start shortly. Announcement was made last week of the proposed establishment of a cigarette manufacturing plant at a cost of $100,000 in one of the small Georgia tobacco belt cities.

Construction Slow on the Pacific Coast

Owing probably to the mid-monthly lull between stock-order periods, contractors' business has been dull, though plenty of varied future work is scheduled, especially in the interior cities. A Redwood City contractor, for example, has recently obtained contracts for a hospital, a high school and the illuminating and control equipment of a drawbridge. Power company and railroad purchasing has been very light in the past week, hardly any order rising above the emergency class. Miscellaneous machinery and power apparatus orders are, however, excellent. A steel foundry has purchased switches, circuit breakers and distributing apparatus to the value of $3,500 for plant rearrangement. A cement company purchased a 400-hp. low-speed synchronous motor valued at $10,000 and two surface condensers, each of 4,000 sq.ft. capacity, as a part of its turbine equipment. Standard-size motors of from 5 hp. to 15 hp. size have tapered off after an unusual demand that persisted two months past the usual peak. Ten motors of ¾ hp. and fifteen of 2 hp. were sold for incorporation in oil-burning machinery, these sizes being larger than the average. The outstanding order covered two electric drive equipments for two new Southern Pacific ferryboats of Diesel-engine design, each equipment costing about $100,000. The order was placed with the Westinghouse Electric & Manufacturing Company by the Moore Dry Dock Company of Oakland.

Merchandise Holds Lead in St. Louis District

Electrical merchandise is holding the lead in the St. Louis district. Jobbers agree that the past week has been appreciably better than in the previous period. All lines report good gains, particularly radio, lighting equipment, lamps and every variety of holiday appliances. The only order deserving particular notice was one for the lead district of St. Francois County, Mo., comprising a miscellaneous lot of motors, transformers, control apparatus and general equipment. This order totaled more than $20,000. Inquiries are coming in from the oil fields of the Southwest for estimates on electric drilling and pumping equipment, also for motor-driven pipe-line pumps, but no orders have been placed. The general feeling is that business is coming in steadily and in good volume.

Activities of the Trade

General Electric Reports Large Sales and Net Earnings

The statement of sales and net earnings of the General Electric Company for the nine months ended Sept. 30, announced by President Gerard Swope, shows the net sales totaled $229,638,216 and the profit available for dividends on 620. The statement of earnings for the

The statement of earnings for the nine months follows:

Net sales billed	$229,638,216.24
Less: Cost of sales billed, including operating, maintenance and depreciation charges, reserves and provision for all taxes	203,690,908.97
Net income from sales	$25,947,307.27
Sundry income less interest paid and sundry charges	5,818,364.60
Profit available for dividends	$31,765,671.87
Less: Dividends on special stock	1,714,052.10
Profit available for dividends on common stock and surplus	$30,051,619.77

The above indicates net earnings equivalent to about $4.17 per share on the 7,211,481 shares of no-par-value common stock.

Westinghouse Company Opens Atlantic City Home

The official opening of an exhibit by the Westinghouse Electric & Manufacturing Company intended to display to the public the year around electrical devices for the home and the business, industrial, marine and transportation worlds, was celebrated at an informal dinner at the Shelburne Hotel, Atlantic City, Wednesday night.

Representatives of civic and commercial interests at Atlantic City congratulated the Westinghouse company on its decision to become one of the resort's permanent exhibitors.

The outstanding feature of the Westinghouse exhibit, which is in the Shelburne Hotel almost opposite the Million-Dollar Pier, is a completely furnished two-story electric home, with living room, dining room, bedroom, bath and basement. The entire display has been so ingeniously designed that on first glance the visitor visualizes a complete home whose front has been removed. Further inspection then reveals the details of the separate rooms.

Maytag Company Makes Another Large Shipment

Five trainloads of Maytag aluminum washers recently left the Maytag factory at Newton, Iowa, en route to the company's Eastern branch, with headquarters in Philadelphia. This shipment consisted of 130 carloads of Maytag washing machines containing more than 110,000 washers valued at $2,000,000. Only a short time ago three trainloads of washers left the Maytag factory at Newton, one scheduled for the Pacific Northwest and two for California. A trainload of Maytag washers was also recently sent to Salt Lake City and another trainload to western Pennsylvania.

The company is now building 1,250 washing machines per day, but this figure will soon be increased to 1,600 machines per day upon the completion of additional buildings now under construction, which will include a large aluminum foundry. The progress of the Maytag Company can be measured by its yearly volume of sales over a period of several years as follows: In 1920 sales were $1,000,000; in 1922, $4,000,000; in 1923, $8,000,000; in 1924, $17,000,000, and in 1925, $35,000,000. The sales quota for 1926 was placed at $50,000,000, and the company states that from all indications this will easily be reached, as a gain of more than 60 per cent for the first eight months of this year as compared with the same period of last year is shown in every part of the country. The company says that it makes about 40 per cent of all the electric washing machines sold.

The Appleton Electric Company, 1701 Wellington Avenue, Chicago, manufacturer of "Unilet" conduit fittings and other products, has under construction a new concrete addition to its plant. This new addition will contain 100,000 sq.ft. of floor space and is being built immediately adjoining the present building, which was erected in 1921.

The Diamond State Fibre Company, Bridgeport, Pa., announces that J. Alexander Regan, who for the past five years has been in charge of the Montreal (Quebec) office, has been made district manager in Michigan, with offices at 425 Insurance Exchange Building, Detroit.

The Electric Power Equipment Corporation, 412 North Eighteenth Street, Philadelphia, announces that Barnes Brothers, Interurban Building, Dallas, Tex., have been appointed its representatives in Texas. Barnes Brothers consist of Ray Barnes, who for a number of years has been connected with the Hubbard Company in Texas, and Arthur Barnes, who has been selling wooden poles and transformers in that territory. Barnes Brothers will also represent the Wagner Electric Company in that territory.

The Electric Machinery Manufacturing Company, 1331 Taylor Street, N.E., Minneapolis, manufacturer of alternating-current machinery, has plans for the erection of a new two-story-and-basement L-shaped addition to its plant, 40 ft. x 110 ft. and 26 ft. x 52 ft.

The Westinghouse Electric & Manufacturing Company announces that it is supplying the Duquesne Light Company, Pittsburgh, with 50 1,200-amp., three-pole, submersible-type, automatic network circuit breakers for use on a part of its system.

The Wagner Electric Corporation, St. Louis, announces that Edward H. Cheney, who since 1909 has been Chicago district manager for the company, has been appointed sales manager, succeeding Thomas T. Richards, who has resigned.

New Equipment Available

Choke Coil

For heavy-capacity circuits a new type of choke coil with reinforced turns has been developed by the Delta-Star Electric Company, Chicago.

The standard coil has the insulators mounted at an angle of 60 deg. to the base, but the unit can be furnished with the insulators mounted at 90 deg. if desired. The coil is at present available in a capacity of 1,600 amp. for 22-kv. service.

Double Expulsion Fuse

A double expulsion fuse is now manufactured by the Line Material Company, South Milwaukee, Wis., in which the fuse cartridge is composed of a heavy continuous insulated tube or explosion chamber, the lower portion being provided with a larger outer tube or second explosion chamber. The fuse links used have a reduced section at the top which fastens into the upper contact and is brought out of the bottom of the tube and up through the outer tube to the lower contact. When the fuse blows the explosion of the gases expels the arc downward, and should the arc hold, the lower explosion chamber comes into play to rupture effectively the circuit. The lower explosion chamber also serves the purpose of blowing out of the box any gases which might tend to pass upward after being expelled from the inner chamber.

The fuse is available in either wood or porcelain housings. The wood-housed type is made for 6,600-volt service in capacities of 100 amp. or 200 amp., while the porcelain-housed type is made for the same voltage but in only the 100-amp. size.

Radiator Valve for Transformers

A new radiator valve developed by the General Electric Company incorporates the good features of the outlet plug previously used in shipping oil-filled transformers with radiators removed and has the additional feature of permitting the removal of a radiator at any time without draining the oil or taking the transformers from service. The valve is mounted in the standard radiator flange, does not extend beyond the flange either outwardly or inwardly and is positively operated both in closing and in opening. Since it is mounted directly in the flange, the valve requires no additional body and no additional gasket joint and is said to take up no more room than the flange itself. It is entirely free from contact or injury on the inside of the tank when lowering the coils.

New Trade Publications

SINGLE-PHASE REFRIGERATOR MOTOR.—A paper distributed by the Baldor Electric Company, 4351 Duncan Avenue, St. Louis, covers the single-phase refrigerator motor. It contains an analysis of the shortcomings of older types and describes an important development giving greater economy, quietness and reliability. Tables giving ball-bearing motor dimensions and sleeve-bearing motor dimensions and also performance data on the new Baldor refrigerator motor are included, as well as illustrations of this motor.

ILLUMINATION.—"Selling More Light by Showing the Public How to Convert Light Into Illumination" is the title of a booklet issued by the Holophane Glass Company, 342 Madison Avenue, New York City, which describes the 1926-27 advertising campaign of the company. The advertisements reproduced in this publication are intended to stimulate the entire electrical business as well as to advertise the Holophane products. A number of illustrations are given showing various typical installations of the Holophane reflectors for industrial lighting, etc.

HIGH-TEMPERATURE INSULATION.—The Celite Products Company, 11 Broadway, New York City, has issued a booklet entitled "High Temperature Insulation." This is a copy of a lecture compiled by the company and which goes into the subject of heat losses in general, methods of determining heat losses through walls and applications of high-temperature insulating materials.

AUTOMATIC ARC WELDING.—A booklet issued by the Lincoln Electric Company, Coit Road and Kirby Avenue, Cleveland, entitled "Automatic Arc Welding with 'Stable-Arc' Automatics," describes and illustrates the various types of Lincoln "Stable-Arc" automatic welders. Tables of speeds and costs of automatic arc welders are included.

BALL BEARINGS.—The New Departure Manufacturing Company, Bristol, Conn., is distributing a booklet entitled "Cutting Your Costs, or What New Departure Ball Bearings Mean in Your Motor," in which it calls attention to the advantages of the use of "New Departure" ball bearings in electric motors.

OIL CIRCUIT BREAKERS.—"The Selection and Application of Oil Circuit Breakers" is the title of publication No. 1,004 issued by the Condit Electrical Manufacturing Corporation, Boston, covering its oil circuit breakers. It contains wiring diagrams for electrically operated switchgear and of automatic oil circuit breakers. Tables giving interrupting capacity ratings of Condit oil circuit breakers are included.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Melbourne, Australia (No. 22,490), for paint and insecticide spraying machine.

Purchase and agency are desired in Durban, South Africa (No. 22,552), for cable.

An agency is desired in Montreal, Canada (No. 22,471), for doctors' and dentists' equipment, electrical equipment for pulp and paper and hydro-electric plants.

An agency is desired in Berlin, Germany (No. 22,520), for electro-dental equipment, electric meters and radio parts (No. 22,468) and precision tools and gages (No. 22,508).

An agency is desired in Munich, Germany (No. 22,472), for electrical household appliances, electrical machines for butchers, electric coffee grinders, cloth-cutting machines, massage apparatus and hair-cutting machines.

An agency is desired in Asuncion, Paraguay (No. 22,469), of small electric lighting plants and radio parts.

An agency is desired in Kovno, Lithuania (No. 22,467), for radio sets and parts.

An agency is desired in Havana, Cuba (No. 22,470), for electric counter refrigerating system and electric washing machines.

Purchase and agency are desired in Bombay, India (No. 22,551), for electric refrigerators.

Agency is desired in Bucharest, Rumania (No. 22,585), for electric light bulbs.

An agency is desired in Montreal, Canada (No. 22,586), for floodlight equipment for railway yards.

An agency is desired in Melbourne, Australia (No. 22,581), for washing machine and vacuum cleaners and electric floor polishers.

An agency is desired in Vienna, Austria (22,580), for electrical household appliances.

Sole agency is desired in Nelson, New Zealand (No. 22,604), for electrical household appliances.

Purchase and agency are desired in Hull, England (No. 22,570), for household and hotel electrical appliances, and electric refrigerators.

An agency is desired in Berlin, Germany (No. 22,582), for novelties in electrical equipment.

Sole agency is desired in Brussels, Belgium (No. 22,583), for electric refrigerators.

An agency is desired in Quebec, Canada (No. 22,584), for electric washing machines.

Purchase or agency is desired in Stockholm, Sweden (No. 22,570), for steam technical apparatus, measuring instruments, etc.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

ISLESBORO, ME.—Plans are under way by the Central Maine Power Company, Augusta, for laying a cable from Castine to Islesboro, a distance of 2½ miles, to cost about $22,000, to furnish electric service here. About 20 miles of transmission lines are being erected by the company on the island.

LOWELL, MASS.—The Lowell Electric Light Corporation plans to erect an office and operating building on Market Street, to cost about $150,000. Stone & Webster, Inc., Boston, is architect and engineer.

LYNN, MASS.—Bids will be received by the Commission on Ways and Drainage of the City of Lynn at the office of the city clerk and city engineer, City Hall, until Nov. 9, for the construction of sewage pumping station and appurtenances, including screening machinery, cranes, hoists, electric wiring and lighting system, transformers with appurtenant connections, heating and ventilating system, etc. Morris Knowles, Inc., is engineer.

NORWICH, CONN.—Contract has been awarded by the Gas and Electric Department for building a new hydro-electric power station, at $34,335. Other contracts will be awarded later.

ROCKVILLE, CONN.—The installation of new ornamental lighting in the business district is under consideration by the Borough Council. The system will be installed by the Rockville-Willimantic Lighting Company, which furnishes electric service here.

Middle Atlantic States

BINGHAMTON, N. Y.—Petitions have been submitted to the City Council requesting the installation of ornamental lamps on Washington Street from Hawley Street to the Susquehanna River.

BROOKLYN, N. Y.—Bids will be received by the Department of Public Welfare, Tenth Floor, Municipal Building, New York City, until Oct. 26 for additions and alterations to the power house and boiler plant at the Kings County Hospital for heating and electric work (contract No. 2), and plumbing (contract No. 3). Bird S. Coler is commissioner.

BUFFALO, N. Y.—Plans have been filed by the Buffalo General Electric Company for an addition to its office and operating building at 39 East Genesee Street, to cost about $200,000.

FREMONT, N. Y.—Permission has been granted the New York State Gas & Electric Company, Ithaca, to extend its system in Fremont. It is proposed to erect about 11 miles of new line, to cost about $20,000.

NEW BERLIN, N. Y.—Authority has been granted the New York State Gas & Electric Company, Ithaca, to extend its electric service to cover the entire town of New Berlin.

SPECULATOR, N. Y.—The Public Service Commission has approved the petition of the village of Speculator for authority to establish a municipal electric plant, also to erect a transmission line on the public highway in the town of Wells. The plant will be located on the Sacandaga River in Wells.

WATERFORD, N. Y.—Permission has been granted the Cohoes (N. Y.) Power & Light Company to extend its gas and electric service in the town of Waterford, to serve that portion of the town, north of the north line of the village and west of the old Champlain Canal.

PRINCETON, N. J.—Plans have been approved by the Borough Council for the installation of an improved lighting system on Nassau and Stockton Streets.

TRENTON, N. J.—The Public Service Electric & Gas Company, Newark, has authorized the installation of an underground conduit system on North Clinton Avenue, between State and Perry Streets, to replace present overhead lines.

HARMONY, PA.—The Harmony Electric Company plans extensions in its transmission lines, including a new line from the station at Brennan to Pine Creek, rebuilding of line from Pine Creek to Ingomar, and erection of a new line from the station at Peet to Hiland.

LANSFORD, PA.—The installation of an ornamental lighting system in the business section is under consideration by the Town Council.

PITTSBURGH, PA.—Work is now under way by the Duquesne Light Company for the installation of an additional 80,000-kw. generating unit and accessories at its Colfax plant.

HAGERSTOWN, MD.—Permission to build a new municipal electric light and power plant has been granted to the Mayor and City Council by the Public Service Commission which also approved issuance of bonds by the municipality in the amount of $300,000 to finance the project.

WASHINGTON, D. C.—Bids will be received by the Quartermaster, Marine Corps, Washington, until Oct. 28, for electrical supplies, including sockets, attachments, receptacles, switches, flexible steel armored conductors, fuses, wire, etc. (Schedule 205.)

North Central States

SAULT STE. MARIE, MICH—Plans are under way by the Michigan Northern Power Company for the construction of a steam-driven electric power plant on Portage Avenue, to cost about $400,000, including a transmission line.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until Oct. 29, for electric meters for the Division of Light and Power.

SANDUSKY, OHIO.—Bids will be received by the Supervising Architect, Treasury Department, Washington, D. C., until Nov. 8, for lighting fixtures for the local post office.

TOLEDO, OHIO.—Steps have been taken by the South Side Chamber of Commerce for the installation of an ornamental lighting system on Broadway.

WELLSVILLE, OHIO.—The City Council has contracted with the Ohio Power Company, Canton, which furnishes the street-lighting service, for the installation of an improved lighting system.

YOUNGSTOWN, OHIO.—The Vindicator Printing Company plans to install electric power equipment in its proposed new newspaper printing plant, to cost about $500,000.

ASHLAND, KY.—The American Rolling Mill Company, Middletown, Ohio, plans to install electric power equipment in proposed additions to its local plant, to cost about $1,000,000.

HOPKINSVILLE, KY. — Surveys are being made by the Kentucky-Tennessee Light & Power Company, Bowling Green, for the erection of a 66,000-volt line to connect Hopkinsville with Murray. H. D. Fitch is president.

LOUISVILLE, KY.—Plans have been announced for the construction of a hydro-electric plant on the Kentucky River by the Kentucky Hydro-Electric Company, a

subsidiary of the Kentucky River Utilities Company, for which $6,250,000 in bonds have been authorized. The new station will be located about 3 miles from the Dix River dam station.

LOUISVILLE, KY.—Plans have been authorized by the Chief of Engineers, United States Army, Washington, D. C., for the construction of power houses at Dams 47 and 51, Ohio River, in this district.

RICHMOND, KY.—The installation of an ornamental lighting system in the business section, to cost about $7,000, is under consideration by the Exchange Club.

CARMI, ILL.—The City Council has decided to rebuild the municipal electric light plant, at a cost of about $95,000. The Chuse Engineering & Manufacturing Company will have charge of the work.

MAYWOOD, ILL.—The Public Service Company of Northern Illinois, Chicago, plans to build an equipment storage and distributing plant on South First Avenue. H. Von Holst, 79 West Monroe Street, Chicago, is architect and engineer.

QUINCY, ILL.—Permission has been granted the Central Illinois Public Service Company, Springfield, to extend its transmission line from Quincy to Clayton, serving Columbus and Coatsburg, and also to purchase the electric plants at Liberty, Mendon and Paloma.

ASHLAND, WIS.—The Lake Superior District Power Company contemplates improvements in its local power plant.

FOND DU LAC, WIS.—Plans have been adopted by the Wisconsin Power & Light Company, Madison, for the erection of a 12-mile transmission line between Oakfield and Oak Center to serve the towns of Byron, Oakfield and Oak Center with a 24-hour service.

MILWAUKEE, WIS. — The Milwaukee Electric Railway & Light Company plans to build an electric car line extending from Howell Avenue south to freight line, thence to power plant, to cost about $25,000.

PESHTIGO, WIS.—A new turbine is to be installed in the local hydro-electric plant of the Wisconsin Service Corporation, Green Bay, to replace the old equipment.

SHEBOYGAN, WIS.—Improvements are contemplated by the Wisconsin Power & Light Company, Madison, to its Falls roller mills, near Sheboygan, including the installation of a new turbine to replace two water wheels.

WAUPUN, WIS.—Negotiations are under way between the City Council and the Wisconsin Power & Light Company, Madison, for renewal of contract for furnishing electricity for operating the municipal electric system. The closing of the contract will mean the erection of a high-tension transmission line from Beaver Dam to Waupun, a distance of about 20 miles, and which will give the city service from Beaver Dam and Fox Lake.

WAUSAU, WIS.—The Wisconsin Valley Electric Company plans to erect a transmission line from Cobtown to its Waupaca properties, 10 miles long, where a substation will also be built. The cost of the line is estimated at $10,000.

FORT SNELLING, MINN.—Bids will be received by the Construction Division, Veterans' Bureau, Washington, D. C., until Nov. 9, for automatic telephone equipment for local buildings.

ST. PAUL, MINN.—Plans have been approved by the City Council for the installation of ornamental lamps on Desnoyer, Glenham and Carroll Avenues. G. M. Shepard is city engineer.

CEDAR RAPIDS, IOWA.—The City Ice Company, Clinton, plans to install electric power equipment in its proposed local ice-manufacturing plant, to cost about $100,000.

DES MOINES, IOWA.—Further extensions are contemplated by the Des Moines Electric Light Company involving an expenditure of about $400,000. The work will include the erection of a transmission line, 20 miles long, to parallel its 44,000-volt line between Des Moines and Prairie City and to increase the present 44,000-volt line between Prairie City and Oskaloosa to 66,000 volts. When this line is completed the company will supply power to the Iowa Southern Utilities Company. A large portion of the appropriation will be used for the purchase and installation of switching equipment for the 66,000-volt line to supply Oskaloosa.

DUBUQUE, IOWA.—A permit has been granted the Tri-State Utilities Company, Minneapolis, Minn., to erect a 33,000-volt transmission line from Butte to the South Dakota line.

SPIRIT LAKE, IOWA.—The Central Iowa Power & Light Company, Waterloo, plans to improve its high-tension transmission line from Spirit Lake to Spencer.

STANWOOD, IOWA.—Work has begun by the Iowa Railway & Light Company, Cedar Rapids, on rebuilding its transmission line near Stanwood. The plans include the erection of a substation near the Miller & Malkey mill, to cost about $15,000.

ROCHEPORT, MO.—Arrangements have been made whereby the town of Rocheport will secure electric service from the Boonville branch of the Missouri Power & Light Company, Mexico.

BRINSMADE, N. D.—Plans are being prepared by the City Council for the erection of a transmission line for local light and power service.

SALEM, S. D.—Plans are under way by the Salem Milling, Lighting & Heating Company for the installation of a new electric plant.

WATERTOWN, S. D. — Extensions are contemplated to the municipal electric plant, including the installation of a 1,500-kw. turbine. A. W. Mullergren, 765 Board of Trade Building, Kansas City, Mo., is engineer.

GORDON, NEB.—Permission has been granted the Nebraska Electric Power Company, Davenport, Iowa, to erect a 13,200-volt transmission line from Gordon to Clinton, Rushville and Hay Springs.

LINCOLN, NEB.—The Nebraska Gas & Electric Company has been authorized to build a 33,000-volt transmission line from Tekamah to a point on the Missouri River, near Blair, a distance of 20 miles.

PAWNEE, NEB.—The City Council has called a special election to vote on the approval of the sale of the municipal electric plant to the Nebraska Gas & Electric Company, Omaha.

WALLACE, NEB.—Bonds to the amount of $20,000 have been voted for the erection of a transmission line from a point at or near Sutherland to Wallace. Electricity will be supplied by the Northwestern Public Service Company, North Platte.

OSAWATOMIE, KAN. — The Missouri-Pacific Railway Company, Railway Exchange Building, St. Louis, plans to make extensions and improvements in the electric power plant at its local shops. E. A. Hadley is chief engineer.

Southern States

COHUTTA, GA.—The plant of the Cohutta Light & Power Company has not been purchased by the Georgia Railway & Power Company, Atlanta, as reported in the issue of Oct. 9.

ELBERTON, GA.— The Seaboard Silk Mills, Elberton, recently formed by officials of the Susquehanna Silk Mills, Sunbury, Pa., plan to install electric power equipment at its proposed local plant, to cost about $125,000. Robert & Company, Bona Allen Building, Atlanta, are architects and engineers.

TYBEE, GA.—The town officials are negotiating with the Savannah (Ga.) Electric Company for the installation of a new street-lighting system.

GUNNTOWN, FLA.—Dowling Brothers, Inc., Tampa, plan to install electric power equipment in a proposed lumber mill in this section, to cost about $750,000. The company has acquired the property of the Gunn Mfg. Company.

MIAMI, FLA.—The City Commission is considering improvements to the Biscayne Boulevard, including sidewalks, storm and sanitary sewers and the installation of special street-lighting system and traffic signal equipment.

CHATTANOOGA, TENN. — Plans are being prepared by the Southern Cities Power Company, Chattanooga, for the construction of two hydro-electric plants and dams on the Duck River, one near Lewisburg, and the other near Shelbyville, Hart, Freeland & Roberts Independent Building, are engineers.

KINGSPORT, TENN.—Plans are under consideration by the Appalachian Power Company, Bluefield, W. Va., for the construction of a substation to cost about $175,000, to be used in connection with a new transmission line from Switchback to Kingsport.

LEBANON, TENN.—The Interstate Ice & Coal Company plans to install electric power equipment in connection with the rebuilding of its local ice-manufacturing plant, recently destroyed by fire with loss of about $200,000.

WEDOWEE, ALA.—The Alabama Power Company, Birmingham, which has acquired the local electric plant, contemplates extensions in transmission line in this section.

BOONEVILLE, MISS.—The Mississippi Power Company, Gulfport, contemplates the erection of additional transmission lines in this vicinity for service at Booneville, Egypt, Shannon and Verona.

PINE BLUFF, ARK.—The City Council is considering plans for the installation of an electric lighting system on Main Street, to cost about $25,000.

MONROE, LA.—The George E. Breese Lumber Company plans to install electric power equipment in its proposed local hardwood mill, to cost about $200,000.

MIAMI, OKLA.—A permit has been granted by the Oklahoma State Irrigation, Drainage and Reclamation Commission to James F. Robinson, Miami, for a hydro-electric development on the Grand River in the northeastern corner of Oklahoma. The plans provide for a total development of 274,000 hp. at a cost of $24,000,000. It is proposed to supply power to Missouri and Arkansas as well as to Tulsa, Muskogee, Miami and other Okmulgee cities.

AMARILLO, TEX. — The Southwestern Public Service Company, Carlsbad, N. M., has acquired a site adjoining Amarillo, upon which it will build at once an electric power plant. The initial installation will have a generating capacity of 5,000 kw. and will cost about $1,500,000. The plans provide for a total capacity of 50,000 kw. The company is now completing a transmission line to Panhandle and Pampa, and contemplates extension of additional lines into the oil field.

BRYAN, TEX. — The installation of ornamental lamps on Bryan Street, to cost about $4,000, has been authorized by the City Commission.

CHILDRESS, TEX.—Surveys are being made by the Central Power & Light Company, San Antonio, for the erection of a transmission line from Childress to Clarendon, to cost about $100,000.

FORT WORTH, TEX.—The Public Utilities Department contemplates improvements at the municipal electric plant, to cost about $20,000.

Pacific and Mountain States

CARSON, WASH.—Plans are being considered by W. G. Hufford, Carson, for a hydro-electric plant near Carson, to develop about 10,000 hp. The cost is estimated at about $250,000.

OSTRANDER, WASH.—The electric distributing system of the Ostrander Railway & Timber Company has been taken over by the Puget Sound Power & Light Company, Seattle which plans to rebuild the system and extend the service north and south along the Pacific Highway.

SEATTLE, WASH. — The Municipal Lighting Department plans to build a transformer station on University Street near First Avenue.

TACOMA, WASH.—Plans have been approved by the City Council for lighting Sixth Avenue all the way out to Titlow Beach and of the Seashore Drive to the Day Island Bridge, by attaching lamp brackets to every third pole.

BEND, ORE.—The Deschutes Power & Light Company has applied for a license to cover 17 miles of 66,000-volt transmission line which is to connect its Bend power house with the substation of the Deschutes Power Company at Redmond.

EUREKA, CAL.—Steps have been taken by the Myrtle Avenue Club for the installation of an ornamental lighting system on Myrtle Avenue.

LOS ANGELES, CAL.—Plans are being prepared by the Southern California Edison Company for a transformer station, at 1138 East Ninety-fifth Street.

LOS ANGELES, CAL.—The Municipal Art Commission has approved petitions, for the installation of ornamental lamps on portions of Fremont Avenue, Lankershim and Beverly Boulevards, to cost about $180,000.

LOS ANGELES, CAL.—The Elias-Katz Shoe Company plans to install electric power equipment in its proposed factory on San Pedro Street, near Seventh Street, to cost about $175,000. W. Douglass Lee, Textile Center Building, is architect.

OCEANSIDE, CAL.—The City Council has approved the installation of improved lighting units in various parts of the city.

New Trade Publications

SINGLE-PHASE REFRIGERATOR MOTOR.—A paper distributed by the Baldor Electric Company, 4351 Duncan Avenue, St. Louis, covers the single-phase refrigerator motor. It contains an analysis of the shortcomings of older types and describes an important development giving greater economy, quietness and reliability. Tables giving ball-bearing motor dimensions and sleeve-bearing motor dimensions and also performance data on the new Baldor refrigerator motor are included, as well as illustrations of this motor.

ILLUMINATION.—"Selling More Light by Showing the Public How to Convert Light Into Illumination" is the title of a booklet issued by the Holophane Glass Company, 342 Madison Avenue, New York City, which describes the 1926-27 advertising campaign of the company. The advertisements reproduced in this publication are intended to stimulate the entire electrical business as well as to advertise the Holophane products. A number of illustrations are given showing various typical installations of the Holophane reflectors for industrial lighting, etc.

HIGH-TEMPERATURE INSULATION.—The Celite Products Company, 11 Broadway, New York City, has issued a booklet entitled "High Temperature Insulation." This is a copy of a lecture compiled by the company and which goes into the subject of heat losses in general, methods of determining heat losses through walls and applications of high-temperature insulating materials.

AUTOMATIC ARC WELDING.—A booklet issued by the Lincoln Electric Company, Coit Road and Kirby Avenue, Cleveland, entitled "Automatic Arc Welding with 'Stable-Arc' Automatics," describes and illustrates the various types of Lincoln "Stable-Arc" automatic welders. Tables of speeds and costs of automatic arc welders are included.

BALL BEARINGS.—The New Departure Manufacturing Company, Bristol, Conn., is distributing a booklet entitled "Cutting Your Costs, or What New Departure Ball Bearings Mean in Your Motor," in which it calls attention to the advantages of the use of "New Departure" ball bearings in electric motors.

OIL CIRCUIT BREAKERS.—"The Selection and Application of Oil Circuit Breakers" is the title of publication No. 1,004 issued by the Condit Electrical Manufacturing Corporation, Boston, covering its oil circuit breakers. It contains wiring diagrams for electrically operated switchgear and of automatic oil circuit breakers. Tables giving interrupting capacity ratings of Condit oil circuit breakers are included.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Melbourne, Australia (No. 22,490), for paint and insecticide spraying machine.

Purchase and agency are desired in Durban, South Africa (No. 22,552), for cable.

An agency is desired in Montreal, Canada (No. 22,471), for doctors' and dentists' equipment, electrical equipment for pulp and paper and hydro-electric plants.

An agency is desired in Berlin, Germany (No. 22,520), for electro-dental equipment, electric meters and radio parts (No. 22,468) and precision tools and gages (No. 22,508).

An agency is desired in Munich, Germany (No. 22,472), for electrical household appliances, electrical machines for butchers, electric coffee grinders, cloth-cutting machines, massage apparatus and hair-cutting machines.

An agency is desired in Asuncion, Paraguay (No. 22,469), of small electric lighting plants and radio parts.

An agency is desired in Kovno, Lithuania (No. 22,467), for radio sets and parts.

An agency is desired in Havana, Cuba (No. 22,470), for electric counter refrigerating system and electric washing machines.

Purchase and agency are desired in Bombay, India (No. 22,551), for electric refrigerators.

Agency is desired in Bucharest, Rumania (No. 22,585), for electric light bulbs.

An agency is desired in Montreal, Canada (No. 22,586), for floodlight equipment for railway yards.

An agency is desired in Melbourne, Australia (No. 22,581), for washing machine and vacuum cleaners and electric floor polishers.

An agency is desired in Vienna, Austria (22,580), for electrical household appliances.

Sole agency is desired in Nelson, New Zealand (No. 22,604), for electrical household appliances.

Purchase and agency are desired in Hull, England (No. 22,570), for household and hotel electrical appliances, and electric refrigerators.

An agency is desired in Berlin, Germany (No. 22,582), for novelties in electrical equipment.

Sole agency is desired in Brussels, Belgium (No. 22,583), for electric refrigerators.

An agency is desired in Quebec, Canada (No. 22,584), for electric washing machines.

Purchase or agency is desired in Stockholm, Sweden (No. 22,570), for steam technical apparatus, measuring instruments, etc.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

ISLESBORO, ME.—Plans are under way by the Central Maine Power Company, Augusta, for laying a cable from Castine to Islesboro, a distance of 2½ miles, to cost about $22,000, to furnish electric service here. About 20 miles of transmission lines are being erected by the company on the island.

LOWELL, MASS.—The Lowell Electric Light Corporation plans to erect an office and operating building on Market Street, to cost about $150,000. Stone & Webster, Inc., Boston, is architect and engineer.

LYNN, MASS.—Bids will be received by the Commission on Ways and Drainage of the City of Lynn at the office of the city clerk and city engineer, City Hall, until Nov. 9, for the construction of sewage pumping station and appurtenances, including screening machinery, cranes, hoists, electric wiring and lighting system, transformers with appurtenant connections, heating and ventilating system, etc. Morris Knowles, Inc., is engineer.

NORWICH, CONN.—Contract has been awarded by the Gas and Electric Department for building a new hydro-electric power station, at $34,335. Other contracts will be awarded later.

ROCKVILLE, CONN.—The installation of new ornamental lighting in the business district is under consideration by the Borough Council. The system will be installed by the Rockville-Willimantic Lighting Company, which furnishes electric service here.

Middle Atlantic States

BINGHAMTON, N. Y.—Petitions have been submitted to the City Council requesting the installation of ornamental lamps on Washington Street from Hawley Street to the Susquehanna River.

BROOKLYN, N. Y.—Bids will be received by the Department of Public Welfare, Tenth Floor, Municipal Building, New York City, until Oct. 26 for additions and alterations to the power house and boiler plant at the Kings County Hospital for heating and electric work (contract No. 2), and plumbing (contract No. 3). Bird S. Coler is commissioner.

BUFFALO, N. Y.—Plans have been filed by the Buffalo General Electric Company for an addition to its office and operating building at 39 East Genesee Street, to cost about $200,000.

FREMONT, N. Y.—Permission has been granted the New York State Gas & Electric Company, Ithaca, to extend its system in Fremont. It is proposed to erect about 11 miles of new line, to cost about $20,000.

NEW BERLIN, N. Y.—Authority has been granted the New York State Gas & Electric Company, Ithaca, to extend its electric service to cover the entire town of New Berlin.

SPECULATOR, N. Y.—The Public Service Commission has approved the petition of the village of Speculator for authority to establish a municipal electric plant, also to erect a transmission line on the public highway in the town of Wells. The plant will be located on the Sacandaga River in Wells.

WATERFORD, N. Y.—Permission has been granted the Cohoes (N. Y.) Power & Light Company to extend its gas and electric service in the town of Waterford, to serve that portion of the town, north of the north line of the village and west of the old Champlain Canal.

PRINCETON, N. J.—Plans have been approved by the Borough Council for the installation of an improved lighting system on Nassau and Stockton Streets.

TRENTON, N. J.—The Public Service Electric & Gas Company, Newark, has authorized the installation of an underground conduit system on North Clinton Avenue, between State and Perry Streets, to replace present overhead lines.

HARMONY, PA.—The Harmony Electric Company plans extensions in its transmission lines, including a new line from the station at Brennan to Pine Creek, rebuilding of line from Pine Creek to Ingomar, and erection of a new line from the station at Peet to Hiland.

LANSFORD, PA.—The installation of an ornamental lighting system in the business section is under consideration by the Town Council.

PITTSBURGH, PA.—Work is now under way by the Duquesne Light Company for the installation of an additional 80,000-kw. generating unit and accessories at its Colfax plant.

HAGERSTOWN, MD.—Permission to build a new municipal electric light and power plant has been granted to the Mayor and City Council by the Public Service Commission which also approved issuance of bonds by the municipality in the amount of $300,000 to finance the project.

WASHINGTON, D. C.—Bids will be received by the Quartermaster, Marine Corps, Washington, until Oct. 28, for electrical supplies, including sockets, attachments, receptacles, switches, flexible steel armored conductors, fuses, wire, etc. (Schedule 205.)

North Central States

SAULT STE. MARIE, MICH.—Plans are under way by the Michigan Northern Power Company for the construction of a steam-driven electric power plant on Portage Avenue, to cost about $400,000, including a transmission line.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until Oct. 29, for electric meters for the Division of Light and Power.

SANDUSKY, OHIO.—Bids will be received by the Supervising Architect, Treasury Department, Washington, D. C., until Nov. 8, for lighting fixtures for the local post office.

TOLEDO, OHIO.—Steps have been taken by the South Side Chamber of Commerce for the installation of an ornamental lighting system on Broadway.

WELLSVILLE, OHIO.—The City Council has contracted with the Ohio Power Company, Canton, which furnishes the street-lighting service, for the installation of an improved lighting system.

YOUNGSTOWN, OHIO.—The Vindicator Printing Company plans to install electric power equipment in its proposed new newspaper printing plant, to cost about $500,000.

ASHLAND, KY.—The American Rolling Mill Company, Middletown, Ohio, plans to install electric power equipment in proposed additions to its local plant, to cost about $1,000,000.

HOPKINSVILLE, KY.—Surveys are being made by the Kentucky-Tennessee Light & Power Company, Bowling Green, for the erection of a 66,000-volt line to connect Hopkinsville with Murray. H. D. Fitch is president.

LOUISVILLE, KY.—Plans have been announced for the construction of a hydro-electric plant on the Kentucky River by the Kentucky Hydro-Electric Company, a

subsidiary of the Kentucky River Utilities Company, for which $6,250,000 in bonds have been authorized. The new station will be located about 3 miles from the Dix River dam station.

LOUISVILLE, KY.—Plans have been authorized by the Chief of Engineers, United States Army, Washington, D. C., for the construction of power houses at Dams 47 and 51, Ohio River, in this district.

RICHMOND, KY.—The installation of an ornamental lighting system in the business section, to cost about $7,000, is under consideration by the Exchange Club.

CARMI, ILL.—The City Council has decided to rebuild the municipal electric light plant, at a cost of about $95,000. The Chuse Engineering & Manufacturing Company will have charge of the work.

MAYWOOD, ILL.—The Public Service Company of Northern Illinois, Chicago, plans to build an equipment storage and distributing plant on South First Avenue. H. Von Holst, 79 West Monroe Street, Chicago, is architect and engineer.

QUINCY, ILL.—Permission has been granted the Central Illinois Public Service Company, Springfield, to extend its transmission line from Quincy to Clayton, serving Columbus and Coatsburg, and also to purchase the electric plants at Liberty, Mendon and Paloma.

ASHLAND, WIS.—The Lake Superior District Power Company contemplates improvements in its local power plant.

FOND DU LAC, WIS.—Plans have been adopted by the Wisconsin Power & Light Company, Madison, for the erection of a 12-mile transmission line between Oakfield and Oak Center to serve the towns of Byron, Oakfield and Oak Center with a 24-hour service.

MILWAUKEE, WIS. — The Milwaukee Electric Railway & Light Company plans to build an electric car line extending from Howell Avenue south to freight line, thence to power plant, to cost about $25,000.

PESHTIGO, WIS.—A new turbine is to be installed in the local hydro-electric plant of the Wisconsin Service Corporation, Green Bay, to replace the old equipment.

SHEBOYGAN, WIS.—Improvements are contemplated by the Wisconsin Power & Light Company, Madison, to its Falls roller mills, near Sheboygan, including the installation of a new turbine to replace two water wheels.

WAUPUN, WIS.—Negotiations are under way between the City Council and the Wisconsin Power & Light Company, Madison, for renewal of contract for furnishing electricity for operating the municipal electric system. The closing of the contract will mean the erection of a high-tension transmission line from Beaver Dam to Waupun, a distance of about 20 miles, and which will give the city service from Beaver Dam and Fox Lake.

WAUSAU, WIS.—The Wisconsin Valley Electric Company plans to erect a transmission line from Cobtown to its Waupaca properties, 10 miles long, where a substation will also be built. The cost of the line is estimated at $10,000.

FORT SNELLING, MINN.—Bids will be received by the Construction Division, Veterans' Bureau, Washington, D. C., until Nov. 9, for automatic telephone equipment for local buildings.

ST. PAUL, MINN.—Plans have been approved by the City Council for the installation of ornamental lamps on Desnoyer, Glenham and Carroll Avenues. G. M. Shepard is city engineer.

CEDAR RAPIDS, IOWA.—The City Ice Company, Clinton, plans to install electric power equipment in its proposed local ice-manufacturing plant, to cost about $100,000.

DES MOINES, IOWA.—Further extensions are contemplated by the Des Moines Electric Light Company involving an expenditure of about $400,000. The work will include the erection of a transmission line, 20 miles long, to parallel its 44,000-volt line between Des Moines and Prairie City and to increase the present 44,000-volt line between Prairie City and Oskaloosa to 66,000 volts. When this line is completed the company will supply power to the Iowa Southern Utilities Company. A large portion of the appropriation will be used for the purchase and installation of switching equipment for the 66,000-volt line to supply Oskaloosa.

DUBUQUE, IOWA.—A permit has been granted the Tri-State Utilities Company, Minneapolis, Minn., to erect a 33,000-volt transmission line from Butte to the South Dakota line.

SPIRIT LAKE, IOWA.—The Central Iowa Power & Light Company, Waterloo, plans to improve its high-tension transmission line from Spirit Lake to Spencer.

STANWOOD, IOWA.—Work has begun by the Iowa Railway & Light Company, Cedar Rapids, on rebuilding its transmission line near Stanwood. The plans include the erection of a substation near the Miller & Malkey mill, to cost about $15,000.

ROCHEPORT, MO.—Arrangements have been made whereby the town of Rocheport will secure electric service from the Booneville branch of the Missouri Power & Light Company, Mexico.

BRINSMADE, N. D.—Plans are being prepared by the City Council for the erection of a transmission line for local light and power service.

SALEM, S. D.—Plans are under way by the Salem Milling, Lighting & Heating Company for the installation of a new electric plant.

WATERTOWN, S. D. — Extensions are contemplated to the municipal electric plant, including the installation of a 1,500-kw. turbine. A. W. Mullergren, 765 Board of Trade Building, Kansas City, Mo., is engineer.

GORDON, NEB.—Permission has been granted the Nebraska Electric Power Company, Davenport, Iowa, to erect a 13,200-volt transmission line from Gordon to Clinton, Rushville and Hay Springs.

LINCOLN, NEB.—The Nebraska Gas & Electric Company has been authorized to build a 33,000-volt transmission line from Tekamah to a point on the Missouri River, near Blair, a distance of 20 miles.

PAWNEE, NEB.—The City Council has called a special election to vote on the approval of the sale of the municipal electric plant to the Nebraska Gas & Electric Company, Omaha.

WALLACE, NEB.—Bonds to the amount of $20,000 have been voted for the erection of a transmission line from a point at or near Sutherland to Wallace. Electricity will be supplied by the Northwestern Public Service Company, North Platte.

OSAWATOMIE, KAN. — The Missouri-Pacific Railway Company, Railway Exchange Building, St. Louis, plans to make extensions and improvements in the electric power plant at its local shops. E. A. Hadley is chief engineer.

Southern States

COHUTTA, GA.—The plant of the Cohutta Light & Power Company has not been purchased by the Georgia Railway & Power Company, Atlanta, as reported in the issue of Oct. 9.

ELBERTON, GA.— The Seaboard Silk Mills, Elberton, recently formed by officials of the Susquehanna Silk Mills, Sunbury, Pa., plan to install electric power equipment at its proposed local plant, to cost about $125,000. Robert & Company, Bona Allen Building, Atlanta, are architects and engineers.

TYBEE, GA.—The town officials are negotiating with the Savannah (Ga.) Electric Company for the installation of a new street-lighting system.

GUNNTOWN, FLA.—Dowling Brothers, Inc., Tampa, plan to install electric power equipment in a proposed lumber mill in this section, to cost about $750,000. The company has acquired the property of the Gunn Mfg. Company.

MIAMI, FLA.—The City Commission is considering improvements to the Biscayne Boulevard, including sidewalks, storm and sanitary sewers and the installation of special street-lighting system and traffic signal equipment.

CHATTANOOGA, TENN. — Plans are being prepared by the Southern Cities Power Company, Chattanooga, for the construction of two hydro-electric plants and dams on the Duck River, one near Lewisburg, and the other near Shelbyville. Hart, Freeland & Roberts Independent Building, are engineers.

KINGSPORT, TENN.—Plans are under consideration by the Appalachian Power Company, Bluefield, W. Va., for the construction of a substation to cost about $175,000, to be used in connection with a new transmission line from Switchback to Kingsport.

LEBANON, TENN.—The Interstate Ice & Coal Company plans to install electric power equipment in connection with the rebuilding of its local ice-manufacturing plant, recently destroyed by fire with loss of about $200,000.

WEDOWEE, ALA.—The Alabama Power Company, Birmingham, which has acquired the local electric plant, contemplates extensions in transmission line in this section.

BOONEVILLE, MISS.—The Mississippi Power Company, Gulfport, contemplates the erection of additional transmission lines in this vicinity for service at Booneville, Egypt, Shannon and Verona.

PINE BLUFF, ARK.—The City Council is considering plans for the installation of an electric lighting system on Main Street, to cost about $25,000.

MONROE, LA.—The George E. Breese Lumber Company plans to install electric power equipment in its proposed local hardwood mill, to cost about $200,000.

MIAMI, OKLA.—A permit has been granted by the Oklahoma State Irrigation, Drainage and Reclamation Commission to James F. Robinson, Miami, for a hydro-electric development on the Grand River in the northeastern corner of Oklahoma. The plans provide for a total development of 274,000 hp. at a cost of $24,000,000. It is proposed to supply power to Missouri and Arkansas as well as to Tulsa, Muskogee, Miami and other Okmulgee cities.

AMARILLO, TEX. — The Southwestern Public Service Company, Carlsbad, N. M., has acquired a site adjoining Amarillo, upon which it will build at once an electric power plant. The initial installation will have a generating capacity of 5,000 kw. and will cost about $1,500,000. The plans provide for a total capacity of 50,000 kw. The company is now completing a transmission line to Panhandle and Pampa, and contemplates extension of additional lines into the oil field.

BRYAN, TEX. — The installation of ornamental lamps on Bryan Street, to cost about $4,000, has been authorized by the City Commission.

CHILDRESS, TEX.—Surveys are being made by the Central Power & Light Company, San Antonio, for the erection of a transmission line from Childress to Clarendon, to cost about $100,000.

FORT WORTH, TEX.—The Public Utilities Department contemplates improvements at the municipal electric plant, to cost about $20,000.

Pacific and Mountain States

CARSON, WASH.—Plans are being considered by W. G. Hufford, Carson, for a hydro-electric plant near Carson, to develop about 10,000 hp. The cost is estimated at about $250,000.

OSTRANDER, WASH.—The electric distributing system of the Ostrander Railway & Timber Company has been taken over by the Puget Sound Power & Light Company, Seattle which plans to rebuild the system and extend the service north and south along the Pacific Highway.

SEATTLE, WASH. — The Municipal Lighting Department plans to build a transformer station on University Street near First Avenue.

TACOMA, WASH.—Plans have been approved by the City Council for lighting Sixth Avenue all the way out to Titlow Beach and of the Seashore Drive to the Day Island Bridge, by attaching lamp brackets to every third pole.

BEND, ORE.—The Deschutes Power & Light Company has applied for a license to cover 17 miles of 66,000-volt transmission line which is to connect its Bend power house with the substation of the Deschutes Power Company at Redmond.

EUREKA, CAL.—Steps have been taken by the Myrtle Avenue Club for the installation of an ornamental lighting system on Myrtle Avenue.

LOS ANGELES, CAL.—Plans are being prepared by the Southern California Edison Company for a transformer station, at 1138 East Ninety-fifth Street.

LOS ANGELES, CAL.—The Municipal Art Commission has approved petitions, for the installation of ornamental lamps on portions of Fremont Avenue, Lankershim and Beverly Boulevards, to cost about $180,000.

LOS ANGELES, CAL.—The Elias-Katz Shoe Company plans to install electric power equipment in its proposed factory on San Pedro Street, near Seventh Street, to cost about $175,000. W. Douglass Lee, Textile Center Building, is architect.

OCEANSIDE, CAL.—The City Council has approved the installation of improved lighting units in various parts of the city,

comprising 6,000 lumen incandescent lamps, mounted on 30-ft. mast arms with refracting type glass shade, etc., for which bids will soon be asked.

PASADENA, CAL.—The Board of Directors is considering the installation of an ornamental lighting system on North Fair Oaks Avenue between Washington Street and the north city limits.

PASADENA, CAL. — Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 9 for the installation of one full magnet control electric freight elevator in the United States post office, Pasadena. For details see Searchlight Section.

SACRAMENTO, CAL.—The City Council is considering the installation of an ornamental lighting system on H Street. A. J. Wagner is city engineer.

SAN FRANCISCO, CAL.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Nov. 2, for 400 storage batteries for the Mare Island navy yard (Schedule 6108).

SAN LEANDRO, CAL.—The City Council is having plans prepared for the installation of an ornamental lighting system on Washington Avenue. R. H. Goodwin is city engineer.

TURLOCK, CAL.—The Turlock Irrigation District has authorized a bond issue of $86,000, for transformers and auxiliary equipment, distributing lines, etc., for the new power development at Don Pedro, now under construction.

CLARKSTON, IDAHO — The Pacific Power & Light Company, Portland, Ore., has authorized the erection of a transmission line between Clarkston and Pomeroy, about 18 miles, to cost about $60,000.

GLENDALE, ARIZ.—The City Council is considering the installation of an improved lighting system on a number of streets.

TOMBSTONE, ARIZ.—The City Council has rejected all bids submitted Sept. 13 for a proposed municipal light and power plant. New bids will soon be asked on revised plans and specifications.

ANACONDA, MONT.—Bids will be received by the City Council, until Nov. 1, for the installation of an ornamental street lighting system in Improvement District 109.

WARLAND, MONT.—The Warland Lumber Mill plans to install electric power equipment in connection with the rebuilding of its mill, recently damaged by fire, with loss of about $100,000.

LOVELOCK, NEV.—The Nevada Valleys Power Company has applied to the Federal Power Commission for a license covering a transmission line from its Tahonton power house. The line will be 29 miles long and will connect with the line of the Truckee River General Electric Company.

ALAMOGORDO, N. M. — The electric power plant, which is being built in connection with the lumber mill of the Breece Lumber Company, has been taken over by the Texas-Louisiana Power Company, Fort Worth. The latter company will complete the plant and high-tension transmission lines.

Canada

POINT GREY, B. C.—Plans are under way by the municipality to install a lighting system on various streets, consisting of 232 ornamental concrete standards, 70,000 ft. of cable, etc., to cost about $69,225. J. W. Southern, 5,851 West Boulevard, Vancouver, is engineer.

VANCOUVER, B. C.—The City Council plans to install ornamental lamps on Hornby Street, to cost about $21,750; and on Pacific Street and Beach Avenue, $7,500.

VANCOUVER, B. C.—Plans are being considered by the City Council for the installation of ornamental lamps on all West End Streets, west of Burrard Street, not at present provided with lamps. It is estimated that 250 lamps will be required, to cost about $84,900. C. H. Fletcher is city electrician.

NIAGARA FALLS, ONT. — The City Council has approved a bylaw granting the Hydro-Electric Commission $70,000 for extensions.

SMOKY FALLS, ONT. — Contract has been awarded by the Spruce Falls Power & Paper Company, Ltd., 300 Bay Street, Toronto, Ontario, for the construction of a power project together with pulp and paper mills at Smoky Falls, to Morrow & Bently, Peterborough, Ontario, at about $12,000,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued Sept. 21, 1926)

1,600,842. ELECTROSTATIC APPARATUS; J. H. Philips, Pauls Valley, Okla. App. filed Sept. 5, 1923. For storing up energy in a dielectric machine and delivering it again from that medium to an electric circuit to produce a flow of current.

1,600,843. TUNGSTEN ARC LAMP; M. Pirani, Wilmersdorf, near Berlin, Germany. App. filed Feb. 8, 1923. Which automatically starts with the line voltage of the ordinary commercial lighting circuit without the provision of special apparatus.

1,600,854. CIRCUIT-OPENING-AND-CLOSING DEVICE; R. J. Smothers, Holyoke, Mass. App. filed Sept. 11, 1925. Designed primarily for use for lighting circuits employed with photographic printing machines of the step and repeat style.

1,600,856. METHOD OF AND APPARATUS FOR ELECTRIC WELDING; W. F. Atoody, Whittier, Cal. App. filed Aug. 19, 1926. Which consists in making the work the negative electrode, and using as the positive electrode a ferrous welding rod which has a low carbon content and is substantially free from lime.

1,600,862. TUNGSTEN ARC LAMP; F. Bahr, Berlin-Charlottenburg, Germany. App. filed May 14, 1924. In which a bimetallic strip is used to cause the separation of the electrodes.

1,600,872. PROTECTIVE ARRANGEMENT; A. S. FitzGerald, Schenectady, N. Y. App. filed Feb. 9, 1925. For polyphase alternating-current circuits and apparatus having windings connected, respectively, in star and delta, such, for instance, as a star-delta power transformer. Arrangements for protecting this type of transformer or the like according to the differential or balanced system of protection, wherein the input is balanced against the output by means of current transformers having their primaries connected respectively, on each side of the star-delta transformer and their secondaries, respectively, in delta and star in a protective circuit adapted in normal conditions to be balanced. Protective relays, or equivalent electro-responsive devices, are connected to this protective circuit to control the operation of the star-delta transformer in response to out-of-balance currents in the protective circuit. The primitive relays, which may be balanced-arm, differential or the like relays, or equivalent electro-responsive devices may when energized complete the circuit of of a tripping coil or an auxiliary signalling or indicating circuit in a well-known manner.

1,600,885. SIGNAL OPERATING MECHANISM FOR GASOLINE TANKS; S. Kanter, New Orleans, La. App. filed May 21, 1923.

1,600,890. CONDUIT OUTLET BOX; M. Kizyma, Trenton, N. J. App. filed April 15, 1924. Of a reversible type whereby the conduit wires may be led from the conduit pipe in an upright or horizontal direction, depending upon the location of the opening in the conduit pipe.

1,600,896. FIRE-ALARM SYSTEM; O. E. Leines, Winnipeg, Manitoba, Canada. App. filed March 15, 1924. Thermostatic circuit closer which will operate to close the circuit through an alarm device when the temperature within a room or building to be protected reaches a certain degree.

1,600,921. COIL BODY FOR ELECTRICAL APPARATUS; E. Bauer, Zug, Switzerland. App. filed Oct. 6, 1924. A spool for an electromagnet or the like, comprising a core and flanges on the end thereof, said core being provided in its face with a longitudinal groove extending to one of the flanges, for the reception of a doubled wire, a projection in said groove near its inner end to lie between the leads of the doubled wire and an opening through the flange at the outer end of said groove for the passage of one lead of the wire.

1,600,963. TRANSFORMER; F. F. Brand, Pittsfield, Mass. App. filed June 3, 1925. In which the magnetic core has a winding leg surrounded by two concentric cylindrical stacks of coils; a transformer including two concentric cylindrical stacks of windings and means responsive to shrinkage of one of said stacks of windings for moving the other of said stacks in the direction of said shrinkage.

(Issued Sept. 28, 1926)

1,600,974. METHOD OF MOUNTING FILAMENTS; E. C. Brueckmann, Bloomfield, N. J. App. filed June 15, 1921. In the making of incandescent lamps.

1,600,994. BOND WIRE HOLDER AND PROTECTOR; W. M. Post, Wilkinsburg, Pa. App. filed March 26, 1923.

1,601,008. CIGAR LIGHTER; L. W. Timmons, Hickory, N. C. App. filed Nov. 13, 1922. Designed for use upon motor vehicles.

1,601,036. GALVANIC CELL WITH AUTOMATIC DEPOLARIZATION; H. D. Nyberg, Norrkoping, Sweden. App. filed May 23, 1922.

1,601,042. ELECTROSCOPE AND CHARGING DEVICE THEREFOR; F. Rosa, Milan, Italy. App. filed Dec. 28, 1923.

1,601,083, 1,601,084. COVER FOR ELECTRIC CONDUIT OUTLET BOXES; J. T. Pearson and R. H. Olley, Syracuse, N. Y. Apps. filed April 17, 1922, and Sept. 27, 1922.

1,601,122. ROTOR CONSTRUCTION; J. T. Janette, Chicago, Ill. App. filed Jan. 18, 1926. Means for providing a suitable abutment on the shaft against which the rotor may be pressed and means for holding the parts in adjusted position in order to provide for a satisfactory support for the rotor on the shaft.

1,601,125, 1,601,126. DYNAMO ELECTRIC MACHINE; G. H. Leland, Dayton, O. Apps. filed Oct. 5, 1921, and Nov. 26, 1921. Single-phase alternating current motors of the repulsion-starting and induction-running type. Centrifugal element for short-circuiting armature.

1,601,151. ELECTRIC COUPLER INTERLOCK; T. H. Thomas, Edgewood, Pa. App. filed July 26, 1921. An interlock between the car and air coupler and the electric coupler.

1,601,164. ELECTRIC TRAIN WIRE COUPLER; C. C. Farmer, Pittsburgh, Pa. App filed June 14, 1922.

1,601,204. SYSTEM OF POWER SUPPLY; O. S. Field, Roselle, N. J. App. filed March 19, 1925. Applicable to a signal system. A system where energy applied to the primary winding of an electro-magnetic device supplies power from a secondary winding on said device through a contact controlled by the primary winding. An automatic method or means for closing a secondary load circuit by energizing a primary supply circuit.

1,601,205. ELECTRICAL RELAY; A. W. Fisher, Wilkinsburg, and C. S. Snaavely, Pittsburgh, Pa. App. filed April 19, 1924. Contact mechanism.

1,601,222. ELECTRIC FURNACE FOR THE TREATMENT OF COMMINUTED CARBONACEOUS MATERIAL AND THE LIKE; J. J. Naugle, Brooklyn, N. Y. App. filed April 21, 1923.

1,601,247. APPARATUS FOR THE PRODUCTION AND MAINTENANCE AND UTILIZATION OF VIBRATORY MOTION; A. Garbarini Courbevoie, France. App. filed July 13 1923.

1,601,255. ELECTRICAL ATTACHMENT PLUG; A. Marra, Brooklyn, N. Y. App. filed Oct. 11, 1924. A plug which may be removed from an electric socket by pulling upon the electric cord leading to the plug, without the fear of conducting wires pulling away from the terminals of the plug.

1,601,283. WELDING MACHINE; H. F. Atkins, Peterborough, England. App filed Dec. 12, 1923. For simultaneously effecting a plurality of welded joints.

1,601,291. SWITCH BOX HOLDER; C. C. Burkhard, Massena, N. Y. App. filed Nov. 26, 1921.

1,601,294. AUTOMATIC FLATIRON CONTROLLER; O. A. Colby, Irwin, Pa. App. filed Sept. 28, 1921. Automatic circuit-interrupting means under the thermal control of the iron.

1,601,312. HOUSING FOR ELECTRICAL FIXTURES; H. K. Krantz, Wilkinsburg, Pa. App. filed June 3, 1921. Protective casings for electrical service connection and meter devices.

1,601,314. CIRCUIT INTERRUPTER; J. N. Mahoney, Brooklyn, N. Y. App. filed Dec. 8, 1917. Of the quick-acting type.

1,601,317. REGULATOR SYSTEM; W. G. Mylius, Wilkinsburg, Pa. App. filed June 5, 1922. A load-regulating system for a motor that is operated from a power circuit feeding other variable load apparatus, and so governing the operation of said motor that the load taken thereby shall not exceed a predetermined maximum demand upon the power circuit. A system of the above-indicated character that comprises a motor operated from a power circuit supplying other variable load apparatus, and regulating the operation of said motor so that it will utilize only that power not consumed by the other variable load apparatus, within a predetermined limit.